

## COVER SHEET

**Name of Site:** East Troy Contaminated Aquifer

**EPA ID No.:** OHSFN0507962

### **Contact Person**

Site Investigation and Documentation Record	Laura Ripley United States Environmental Protection Agency, Region V 77 West Jackson Boulevard, Mail Code: SR-6J Chicago, Illinois 60604 312-886-6040
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### **Pathways, Components or Threat Not Scored**

**Surface Water Migration Pathway:** There are insufficient data to satisfy the Hazard Ranking System (HRS) requirements for establishing the threat of release to surface water at the East Troy Contaminated Aquifer site. The surface water pathway has not been scored due to lack of sufficient information.

**Soil Exposure Pathway:** There are insufficient data to satisfy the HRS requirements for establishing the threat of soil exposure at the East Troy Contaminated Aquifer site. The soil exposure pathway has not been scored due to lack of sufficient information.

**Air Migration Pathway:** There are insufficient data to satisfy the HRS requirements for establishing the threat of release to air at the East Troy Contaminated Aquifer site. The air pathway has not been scored due to lack of sufficient information.

## HRS DOCUMENTATION RECORD

Name of Site: East Troy Contaminated Aquifer      Date Prepared: September 2007  
Revised: September 2008

EPA Region: V

Street Address\*: East portion of City of Troy

City, County, State, Zip Code: Troy, Miami, Ohio (Figure 1) (Ref. 3, p. 1), 45373

General Location in State: The East Troy Contaminated Aquifer is located in the eastern portion of City of Troy along western bank of Miami River.

Topographic Map: The location of the East Troy Contaminated Aquifer is depicted on the Troy, Ohio, Quadrangle, U. S. Geological Survey 7.5-Minute Series Topographic Maps (Refs. 3; 3B).

Latitude: 40.0381° North (Refs. 3; 3B)

Longitude: 84.1961° West (Refs. 3; 3B)

The latitude and longitude listed above mark the approximate location of the Spinnaker building within the East Troy Contaminated Aquifer site (Refs. 3; 3B; Figure 1 of this documentation record).

\* The street address, coordinates, and containment locations presented in this HRS documentation record identify the general area the site is located. They represent one or more locations EPA considers to be part of the site based on the screening information EPA used to evaluate the site for NPL listing. EPA lists national priorities among the known “releases or threatened releases” of hazardous substances; thus, the focus is on the release, not delineated boundaries. A site is defined as where a hazardous substance has been “deposited, stored, placed, or otherwise come to be located.” Generally, HRS scoring and the subsequent listing of a release merely represent the initial determination that a certain area may need to be addressed under CERCLA. Accordingly, EPA contemplates that the preliminary description of facility boundaries at the time of scoring will be refined as more information is developed as to where the contamination has come to be located.

### Scores

Ground Water Migration Pathway	-	100.00
Surface Water Migration Pathway	-	0.00
Soil Exposure Pathway	-	0.00
Air Pathway	-	<u>0.00</u>
<b>HRS SITE SCORE</b>		<b>50.00</b>

## WORKSHEET FOR COMPUTING HRS SITE SCORE

	<u>S</u>	<u>S<sup>2</sup></u>
1. Ground Water Migration Pathway Score (S <sub>gw</sub> ) (from Table 3-1, line 13)	<u>100</u>	<u>10,000</u>
2a. Surface Water Overland/Flood Migration Component (from Table 4-1, line 30)	<u>NS</u>	---
2b. Ground Water to Surface Water Migration Component (from Table 4-25, line 28)	<u>NS</u>	---
2c. Surface Water Migration Pathway Score (S <sub>sw</sub> ) (enter the larger of lines 2a and 2b as the pathway score)	<u>NS</u>	---
3. Soil Exposure Pathway Score (S <sub>s</sub> ) (from Table 5-1, line 22)	<u>NS</u>	---
4. Air Migration Pathway Score (S <sub>a</sub> ) (from Table 6-1, line 12)	<u>NS</u>	---
5. Total of $S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2$		<u>10,000</u>
6. <b>HRS Site Score</b> Divide the value on line 5 by 4 and take the square root.	<b><u>50.00</u></b>	

Notes:

NS – Not Scored

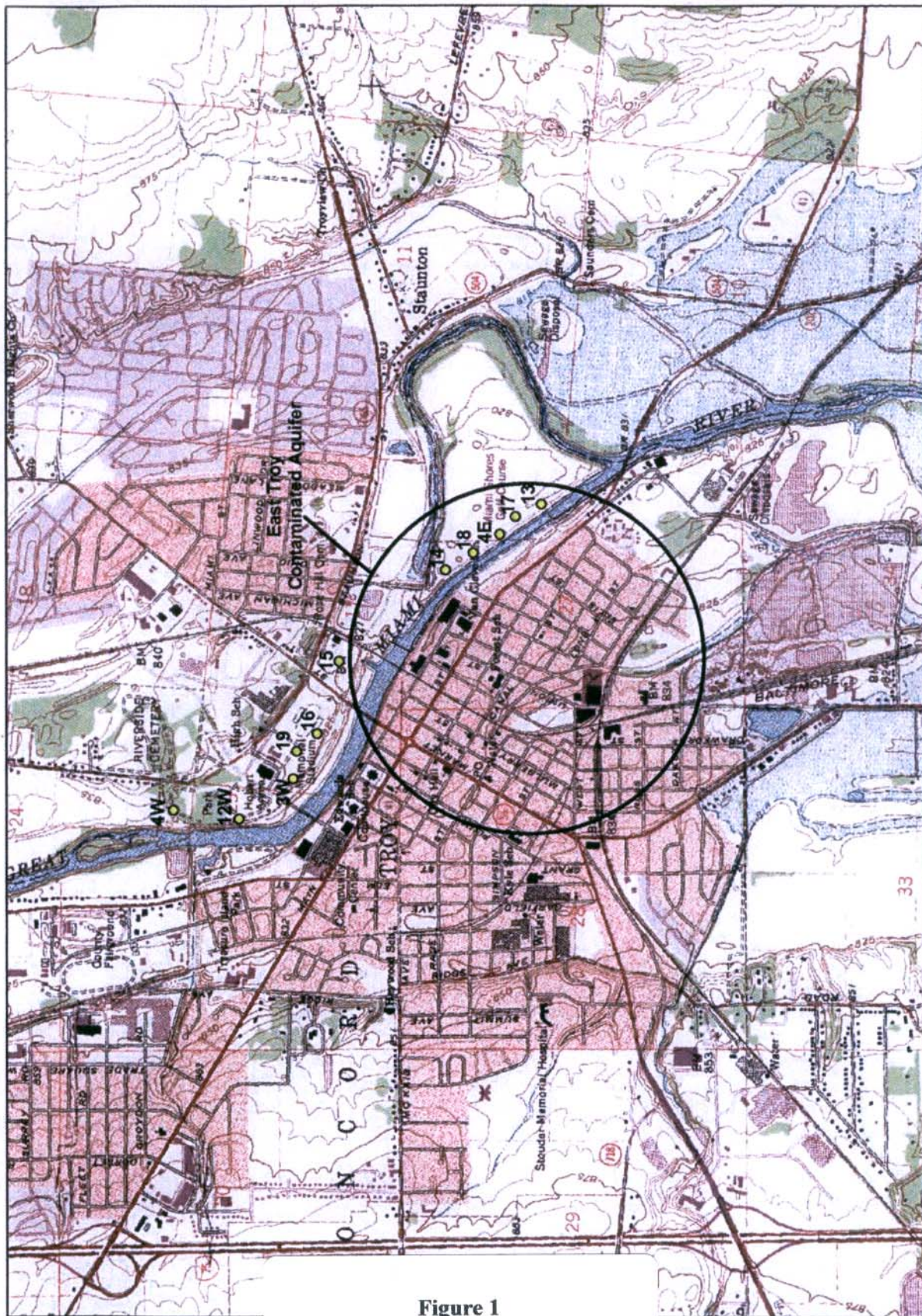
**HRS Table 3-1 – Ground Water Migration Pathway Scoresheet  
East Troy Contaminated Aquifer**

<u>Factor Categories and Factors</u>	<u>Maximum Value</u>	<u>Value Assigned</u>
<b>Likelihood of Release to an Aquifer:</b>		
1. Observed Release	550	550
2. Potential to Release:		
2a. Containment	10	NS
2b. Net Precipitation	10	NS
2c. Depth to Aquifer	5	NS
2d. Travel Time	35	NS
2e. Potential to Release (lines 2a x (2b+ 2c+2d))	500	NS
3. Likelihood to Release (higher of lines 1 and 2e)	550	550
<b>Waste Characteristics</b>		
4. Toxicity/Mobility	(a)	10,000
5. Hazardous Waste Quantity	(a)	10
6. Waste Characteristics	100	18
<b>Targets:</b>		
7. Nearest Well	50	20
8. Population:		
8a. Level I Concentrations	(b)	0
8b. Level II Concentrations	(b)	0
8c. Potential Contamination	(b)	1700.5
8d. Population (lines 8a+8b+8c)	(b)	1700.5
9. Resources	5	5
10. Wellhead Protection Area	20	20
11. Targets (lines 7+8d+9+10)	(b)	1745.5
<b>Ground Water Migration Score for the Aquifer</b>		
12. Aquifer Score [(lines 3X6X11)/82,500] <sup>c</sup>	100	100
<b>Ground Water Migration Pathway Score:</b>		
13. Pathway Score ( $S_{gw}$ ) (highest value from line 12 for all aquifers Evaluated) <sup>c</sup>	100	100

Notes:

- a. Maximum value applies to waste characteristics category
  - b. Maximum value not applicable
  - c. Do not round to highest integer
- NS - Not Scored





13  
 ● City production well

Figure 1. Site Location  
 From USGS Troy Quadrangle



Figure 1  
 Site Location Map  
 (Ref. 39, p. 6)

## REFERENCES

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## SITE DESCRIPTION

The East Troy Contaminated Aquifer site consists of contaminated soil at the Spinnaker Coating property and commingled ground water contamination from both the contaminated soil source and a ground water plume with no known source(s) in the City of Troy (see Sections 2.2 and 3.1.1 of this HRS documentation record).

The City of Troy is located in Miami County, Ohio, approximately 20 miles north of the City of Dayton (Refs. 8, pp. 5, 6; 9, pp. 6, 7; 13, pp. 5, 6). The City of Troy operates two well fields located along the Great Miami River (Refs. 4, pp. 3, 4; 8, pp. 5, 6; 9, pp. 6, 7; 11, p. 3; 12A, p. 17; 13, pp. 5, 6; 18; 19, pp. 8, 9). Five wells are located in the West Well Field and five wells are located in the East Well Field (Refs. 4, pp. 3, 4; 8, pp. 5, 6; 9, pp. 6, 7, 25; 13, pp. 5, 6, 18; 18; 19, pp. 8, 9). Two industrial facilities, including Spinnaker Coating, which manufactures adhesive-coated paper, and Hobart Cabinet, which makes cabinets, are located west and northwest of the east well field (Refs. 6, pp. 4, 5; 7, p. 10, 11; 8, pp. 6, 20; 9, pp. 7, 18; 13, pp. 6, 18; 18; 20; 21; 22, p. 8).

The City of Troy operates five municipal wells in the East Well Field: PW-14, PW-18, PW-4E, PW-17 and PW-13 (Refs. 4, pp. 1, 3, 4; 18; 12A, p. 25; 29). The East Well Field is located on Miami Shores Golf Course (Ref. 4, pp. 3, 4). The City of Troy operates five municipal wells in the West Well Field: PW-4W, PW-12W, PW-3W, PW-19 and PW-16 (Refs. 4, pp. 3, 4; 18). The West Well Field is located on Hobart Arena/Troy Community Park (Refs. 4, pp. 3, 4). Cis-1,2-dichloroethene (Cis-1,2-DCE) has been detected in estimated quantities in two municipal wells PW-14 and PW-18 (Refs. 5, pp. 2, 4; 8, pp. 5, 7, 10, 14, 16, 17, 111, 113; 9, pp. 8, 14, 25-26; 13, pp. 7, 10, 664; 14, pp. 12, 14). These two municipal wells are located within 0.25-mile to one-mile radius of the East Troy Contaminated Aquifer site (Ref. 9, p. 18; 18).

Brown-Bridge (Spinnaker Coating Plant #1) is located at 518 East Water Street (Refs. 6, p. 4; 7, p. 10; 20). Operations on the Spinnaker property began in 1928 when Brown-Bridge began manufacturing adhesive products (6, p. 4; 7, p. 11). In 1971 the plant was acquired by Kimberly-Clark Corporation and continued operation of the facility (Refs. 6, p. 4; 7, p. 11; 20). In 1994 the property was sold to Spinnaker Coating Inc. and Spinnaker continued operation of the facility (Ref. 7, p. 11; 22, p. 8). The facility manufactures pressure-, moisture-, and heat-sensitive adhesive stock for labels, stamps, and related items (Refs. 6, p. 4; 20). During a record search, it was determined that an additional sliver property, approximately 30 feet wide and 260 feet long had previously been a rail spur, which branched from the main Baltimore and Ohio Railroad to service the Brown-Bridge facility and neighboring operation owned

by Hobart Company (Hobart) (Ref. 6, pp. 4, 5). Hobart maintains a 20,000 gallon underground storage tank (UST) behind its facility, which is reportedly used to store heating oil (Ref. 6, p. 6). Applied Engineering and Science, Inc. (AES) was contracted by Kimberly-Clark to collect soil samples from the former rail spur and around the Hobart UST (Ref. 6, p. 6). Significant levels of volatile organic compounds (VOCs) were detected in one soil sample (SB4) (Ref. 6, p. 11). VOCs detected in SB4 include benzene; cis-1,2-dichloroethene (cis-1,2-DCE); methylene chloride; naphthalene; trichloroethene (TCE); 1,2,3-trichlorobenzene; 1,2,4-trichlorobenzene; 1,1,2-trichloroethane; tetrachloroethene (PCE); toluene; and xylene (Ref. 6, p. 11). The concentration of TCE detected was 12,000 micrograms per kilogram ( $\mu\text{g}/\text{kg}$ ) (Ref. 6, p. 11). Significant levels of semi-volatile organic compounds (SVOCs) were detected in soil samples SB1, SB4 and SB8 (Ref. 6, p. 12). SVOCs detected include anthracene, acenaphthylene, benzo(a)anthracene, benzo(g,h,i)perylene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno (1,2,3-cd) pyrene, phenanthrene and pyrene. Highest concentrations of these SVOCs were detected in soil sample SB4 (Ref. 6, p. 12).

Site investigations that were completed in 1993 and 1994 by Kimberly-Clark and a potential purchaser of the Spinnaker property, as a part of the sale of property delineated impacted soil and ground water at the site (Refs. 7, p. 12; 8, p. 7; 9, p. 8; 11, p. 4; 13, p. 7; 20). The areas that were investigated included former bulk storage area, former hazardous waste storage area, former 300-gallon UST used for gasoline storage and non-hazardous waste storage area (Ref. 7, p. 12). The soil and ground water sampling for VOCs, polycyclic aromatic hydrocarbons, heavy metals, polychlorinated biphenyls (PCBs) and pesticides was performed (Ref. 7, p. 12). As part of the site assessments, 11 monitoring wells were installed (three were later abandoned), 53 soil borings were completed, and 56 ground water and 60 soil samples were collected and analyzed (Ref. 7, p. 12). Fuel oil constituents and VOCs including PCE; 1,1,1-trichloroethane (1,1,1-TCA); TCE; cis-1,2-DCE; vinyl chloride; 1,1-dichloroethane (1,1-DCA); and chloroethane were detected in soil and ground water (Ref. 7, pp. 12-13). Remediation started in April 1995 with the removal of impacted soil from the west end of the facility and installation of remediation systems (Refs. 7, p. 13; 8, p. 7; 9, p. 8, 26; 11, p. 4; 13, p. 7; 20). Impacted soil was excavated and transported from the property for disposal from the bulk storage area, adjacent operational areas and non-hazardous waste storage area (Ref. 7, p. 13; 20). The soil excavation extended to the water table (Ref. 7, p. 14). Evidence was found that releases had occurred in the vicinity of the fuel oil and recycled toluene tanks (Ref. 7, p. 14). Soil samples were taken from the walls and floors of the excavations (Ref. 7, p. 14). The data from the analysis were used to guide the excavation and confirm that established cleanup goals were met (Ref. 7, p. 14). Upon completion of the excavation, a pump-and-treat system was designed and installed to address the ground water contamination on the west side of the Spinnaker property (Ref. 7, p.

14). The pump-and-treat system included four extraction wells (PW-1, PW-2, PW-3, and PW-4), an oil/water separator tank, an air-stripping reactor, and a network of monitoring wells (Ref. 7, p. 14). Since the operation began, one of the extraction wells (PW-1) was discontinued because this well no longer extracted significant concentrations of constituents of concern (COCs) and an alternate well (EEIB-2) was brought online (Ref. 7, p. 14). Three extraction wells, PW-1, PW-2 and EEIB-2, are located downgradient of the former bulk storage area (Ref. 7, p. 15). Two extraction wells, PW-3 and PW-4, are located downgradient of the Nonhazardous Waste Storage Area (Ref. 7, p. 15). The ground water remediation system began continuous operation in August 1995 and continues to operate (Refs. 7, pp. 14-15; 8, p. 7; 9, pp. 8, 25, 26; 11, p. 4; 13, p. 7; 20).

Ohio EPA prepared an Integrated Assessment Report (IAR) for the East Troy Contaminated Aquifer site in June 2000 (Ref. 8, p. 1). For the IAR, Ohio EPA contractor IT Corporation advanced five borings at the Spinnaker Coating Facility and one boring on city property north of the Great Miami River and east of the Troy water plant (Ref. 8, p. 8). Water samples were collected from each boring, generally from 20-30 feet below ground surface (bgs), 30-40 feet bgs, and 40-50 feet bgs (Ref. 8, p. 8). IT Corporation installed two monitoring wells, RS04 and RS06, on the north side of the Spinnaker property (Ref. 8, pp. 8, 22). Samples were collected from two Troy municipal production wells, two production wells at the Spinnaker property, four treatment wells at the Spinnaker Property, new monitoring wells and existing monitoring wells: KMW-7, KMW-5, EEIB-12, GZA-1, KMW-6, EEIB-4, KMW-8D, KMW-8S, KMW-28, RS02, RS03, RS06, EEIB-8, EEIB-7, RS04, S-East, S-West, KMW-3, KMW-4, KMW-2, EEIB-9, KMW-9, GZA-2 (Ref. 8, pp. 8, 9, 22). Samples were also taken from ground water extraction wells, including two City of Troy wells: PW-1, PW-2, PW-3, PW-4, TW-18 and TW-14, which were analyzed for VOCs (Ref. 8, p. 8, 22). The water samples were analyzed for VOCs by New Age/Landmark's mobile laboratory for VOCs using SW846 Method 8260B (Ref. 8, pp. 9, 25-114). VOCs, including benzene; chloroform; cis-1,2-DCE; dibromomethane; ethylbenzene; 1,1-DCA; 1,1,1-TCA; TCE; PCE; toluene; and vinyl chloride, were detected in ground water samples (Refs. 8, pp. 1, 2, 8-14, 16, 17, 22, 43, 45, 51, 53, 55, 61, 63, 65, 69, 71, 73, 75, 77, 79, 81, 85, 91, 93, 95, 99, 101, 103, 105, 109, 111, 113; 9, pp. 8, 25, 26; 11, pp. 3-9, 34-38; 13, p. 7).

Ohio EPA prepared an Expanded Site Inspection (ESI) Report for the East Troy Contaminated Aquifer in September 2002 (Ref. 9, p. 1). For the ESI, Ohio EPA contractor, IT Corporation, advanced approximately 20 borings and collected ground water samples from 19 borings (GP01, GP02, GP03, GP04, GP05, GP06, GP07, GP08, GP09, GP10, GP11, GP12, GP13, GP14, GP15, GP16, GP17, GP18, and GP19) (Ref. 9, pp. 9, 19, 28-29, 37, 63-82). The borings for ground water sampling were installed in a predominantly residential neighborhood south and west of the Spinnaker Coating Facility (Ref. 9, pp.

19, 37). Ground water was found in 19 of 20 borings (Ref. 9, p. 9). The ground water samples were analyzed for VOCs using SW846 Method 8260B by Severn Trent Laboratories, Inc. of North Canton, Ohio (Ref. 9, pp. 9, 83-85). VOCs detected included PCE; TCE; cis-1,2-DCE; and vinyl chloride (Ref. 9, pp. 6-8, 10-12, 14, 21, 25, 26, 31-32, 34-37, 83-95; 13, pp. 5, 7). IT Corporation installed four monitoring wells (OEPA1, OEPA2, OEPA3, and OEPA4) at the site (Ref. 9, pp. 9, 29-30). The ground water samples from the monitoring wells were analyzed for VOCs by a U.S. EPA Contract Laboratory Program (CLP) laboratory (Ref. 9, p. 10). The selected VOCs detected in the monitoring wells include PCE, TCE and cis-1,2-DCE; low levels of toluene and benzene were also detected in the wells (Refs. 9, pp. 1, 2, 6-8, 10-12, 14, 21, 25, 26, 29-32, 34-37, 83-95; 9B, pp. 3-5; 13, pp. 5, 7).

In June 2004, a Work Plan for Soil and Ground water Delineation was submitted to OEPA for the former Brown-Bridge Industries Inc (Ref. 7, p. 10). The facility was occupied by Spinnaker Coating Inc (Ref. 7, p. 10). The work plan was designed to address three interrelated issues for which OEPA had expressed concerns regarding the Site:

- The interpreted direction of ground water flow across the Spinnaker property from Water Street to the Great Miami River.
- The breakdown of PCE in ground water entering the Spinnaker property from upgradient, off-site source(s) to the daughter products detected at the downgradient of the Spinnaker Property boundary.
- The concentration of constituents of concern (COC) remaining in site soil after the 1995 remediation, specifically trichloroethene (TCE) (Ref. 7, p. 10).

In 2005 and 2006, Shaw Environmental Inc. (Shaw) on behalf of Kimberly-Clark Corporation, implemented the work plan and conducted a supplemental soil and ground water study (Ref. 7, pp. 1, 16, 19, 21, 22). On March 29 through April 1, 2005, a total of 21 soil borings (PSB-2, PSB-3, PSB-4, PSB-5, PSB-7, PSB-9, PSB-11, PSB-12, PSB-13, PSB-14, PSB-15, PSB-16, PSB-17, PSB-18, PSB-20, PSB-21, PSB-22, PSB-23, ASB-1, ASB-2, and, ASB-3) were advanced on the Spinnaker property for soil and ground water sampling (Ref. 7, pp. 16, 17, 40-41). The soil and ground water samples were shipped to the Test America, Inc. laboratory in Dayton, Ohio (Ref. 7, p. 18). The samples were analyzed for VOCs using U.S. EPA Method 8260B (Ref. 7, p. 18). On May 2 through May 5, 2005, an additional 21 soil borings (SSB-1, SSB-2, SSB-3, SSB-4, SSB-5, SSB-6, SSB-7, SSB-8, SSB-9, SSB-10, SSB-11, SSB-12, SSB-13, SSB-14, SSB-15, SSB-16, SSB-17, SSB-18, SSB-19, SSB-20, SSB-21) were advanced on the Spinnaker property (Ref. 7, pp. 19-20, 42-50). Samples were collected and analyzed by Direct Push Analytical Corporation's mobile laboratory using method 8260B for VOCs (Ref. 7, pp. 20-21). Soil

boring SSB-21 was used to collect three Shelby tubes for geotechnical analysis by the Test America Inc., laboratory in Dayton, Ohio (Ref. 7, pp. 20, 51). Based on the results of the March and May 2005 investigations, eight new monitoring wells (KMW-10 through KMW-17) were installed on the Spinnaker property (Ref. 7, p. 21). 1,1-DCA, 1,1-DCE, Cis-1,2-DCE, trans-1,2-DCE, ethylbenzene, PCE, toluene, 1,1,1-TCA, TCE, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, vinyl chloride, and xylenes were detected in soil samples collected on the Spinnaker property (Ref. 7, pp. 25-26, 40-50). Analytical results from the newly installed wells along the western Spinnaker property boundary (KMW-10, KMW-11 and KMW-15) indicated the presence of cis-1,2-DCE; PCE; and TCE (Ref. 7, pp. 29-30, 68-71). Ground water flow direction for three ground water monitoring events (May 17, 2005; August 31, 2005; and December 13, 2005) is primarily southwest to northeast across the site area (Ref. 7, pp. 30, 34). The soil contamination area is shown in Reference 7A. The ground water plume is shown in Figures 2 and 3 of this HRS documentation record.

In 2007, Ohio EPA conducted a Supplemental ESI report to summarize the data collected between the 2002 ESI and the referral to EPA's removal section in 2006 (Refs. 13, p. 5; 23; 24, pp. 1,2). On June 30, 2006, the Ohio EPA requested U.S. EPA assistance in conducting a time-critical removal action at the East Troy Contaminated Aquifer (Troy VOC Plume Site), located in Troy, Ohio (Refs. 13, p. 5; 24, pp. 1, 2; 39, p. 1). Ohio EPA investigations show that ground water is contaminated with TCE, PCE, and associated degradation products (Refs. 8, pp. 5, 7, 10, 14, 16, 17, 111, 113; 9, pp. 8, 14, 25-26; 13, pp. 5, 7, 10-11, 269-341, 664; 14, pp. 12, 14; 24, pp. 1, 2). Wells within the Troy East Well Field have been impacted with VOCs at concentrations below MCLs (Refs. 2, p. 44; 5, pp. 1-2, 4). PCE and other VOCs have been detected in indoor air samples collected by the city of Troy from several occupied structures including the Troy police station, a church, and a school (Refs. 24, p. 1; 39, pp. 7, 8). From July 2006 through April 2007, EPA collected sub-slab and indoor air samples from a total of 85 locations, which included 78 residences, 2 churches, 4 schools and the Troy Police Station during Phase 1 and Phase 2 air sampling activities (Ref. 24, pp. 1, 2).

Note: References 4 and 15 have been designated as confidential. These documents were provided by Ohio EPA to U.S. EPA and according to an electronic mail message received from Ohio EPA these documents are public record and are not considered confidential (Ref. 29, p.1).





**Figure 2**  
**Ground Water Sampling Results**  
**for PCE**  
 (Ref. 39, p. 8)

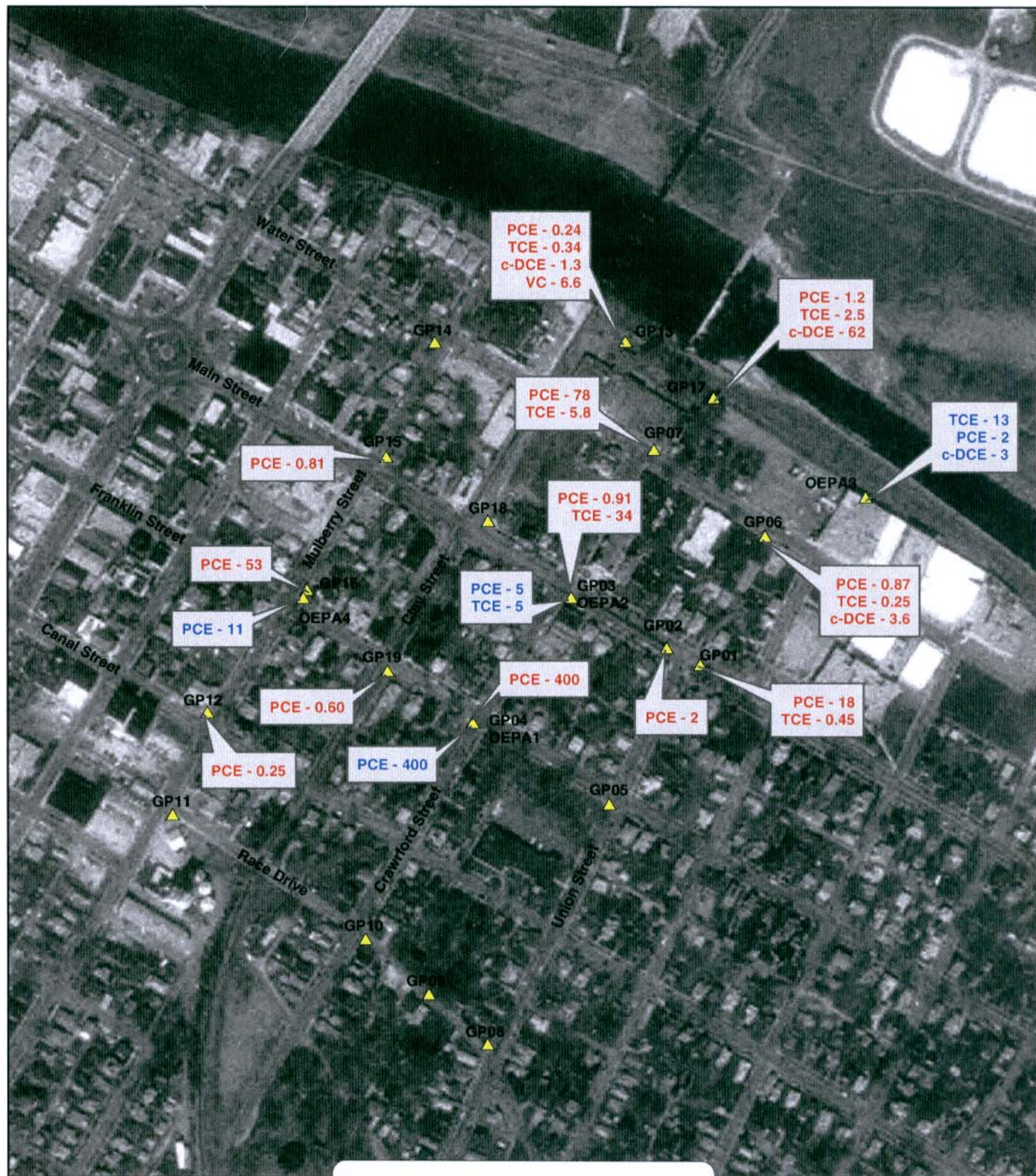
Ground-Water Sampling Results for PCE  
 Concentrations in ug/l

**OhioEPA**

- Direct-push boring (2002)
- Geoprobe (2003)
- Geoprobe (2004)
- Monitoring well







**Figure 3**  
**Contaminated Aquifer Plume**  
 (Ref. 9, p. 19)

Notes:  
 Values in red are direct push samples.  
 Values in blue are monitoring well samples.  
 PCE - tetrachloroethene  
 TCE - trichloroethene  
 c-DCE - cis-1,2-dichloroethene



▲ Sampling location



## 2.2 SOURCE CHARACTERIZATION

There are at least two sources associated with ground water contamination at East Troy Contaminated Aquifer site, which will be described in this section. Cis-1,2 DCE and TCE have been detected in the City of Troy east municipal well field since 1988 (Refs. 8, p. 7; 9, p. 8; 13, p. 7). Investigations conducted at the Spinnaker property in 1993 and 1994 revealed that toluene and chlorinated solvent contamination were released at the Spinnaker property (Refs. 6, pp. 1, 7-16; 8, p. 7; 9, p. 8; 13, p. 7; 16, pp. 1, 2; 17, pp. 8, 10; 29). Ground water investigations performed at the Spinnaker property determined that cis-1,2 DCE and other solvents found in ground water could also be present upgradient (southwest) of the Spinnaker property (Refs. 8, p. 7; 9, p. 8; 13, p. 7). Ohio EPA's integrated assessment report dated June 2000 confirmed that the Troy well field and aquifer in the vicinity of the Spinnaker property was contaminated with VOCs (Refs. 8, pp. 1, 5, 17; 9, p. 8; 13, p. 7). Ohio EPA ESI dated 10 September 2002 confirmed that the aquifer upgradient of the Spinnaker property is contaminated with VOCs emanating from multiple sources (Refs. 9, pp. 3, 6, 14; 13, pp. 5, 7). The samples collected during the ESI indicated that a release of TCE has occurred at the Spinnaker property, and that several sources of PCE potentially lie southwest of Spinnaker Property (Ref. 13, pp. 5, 7).

Based on the information presented above a larger PCE plume is present within the aquifer upgradient and beneath the Spinnaker property and the sources responsible for PCE contamination have not been determined. Also, TCE contamination in soil and ground water is present under the Spinnaker property (See Sections 2.2.2 and 3.1.1 of this HRS documentation record). After migrating beneath the Spinnaker property, the PCE plume receives TCE contamination. Therefore, at the Spinnaker property the TCE and the PCE plume form a commingled plume and threaten the downgradient City of Troy's East Municipal Well Field (See Section 3.0.1 of this HRS documentation record). Therefore there are two sources: one source (Source 1) contributes primarily TCE contamination to the underlying aquifer and a second source (Source 2) contributes PCE contamination to the underlying aquifer.

Source 1 is an industrial property (Spinnaker property) and reflects TCE and other chlorinated solvent contamination in the soil and contamination in the East Troy Contaminated Aquifer under the Spinnaker property (Refs. 6, p. 4; 7, p. 10; 8, pp. 5, 6, 20; 9, pp. 6, 7, 18, 25; 11, pp. 3, 4; 13, pp. 5, 6, 18; 20). Based on the soil sampling conducted by Shaw in 2005, a contaminated soil source area is present on the site. As shown in Section 2.2.1 of this HRS documentation record the primary contaminant of concern (COC) is TCE. TCE was detected in several soil samples exceeding the reporting limit. TCE was not detected in the background soil sample. A site-specific background sample was not designated during the sampling event; therefore, a soil boring with soil not contaminated by TCE was utilized as a background

sample (Ref. 7). TCE is not a naturally occurring constituent but is a manufactured chemical (Ref. 26, p. 5).

Source 2 is a ground water PCE contamination plume extending upgradient and underneath the Spinnaker property. The upgradient source(s) for PCE contamination is not known. The PCE plume extends beneath the Spinnaker property. Based on this information the source type is “other,” ground water plume with no identified source (See Section 2.2.1, Source 2, and Figures 2 and 3 of this HRS documentation record).



## **2.2.1 SOURCE IDENTIFICATION**

Source Number: 1

Source Type: Contaminated Soil

Description and Location of Source (with reference to a map of the site):

Contaminated soil was excavated from the Bulk Storage Area and Non-hazardous Waste Storage Areas. A total of 715 cubic yards (cu. yd.) of soil was removed from the Bulk Storage Area and adjacent operational areas for off property disposal (Ref. 7, p. 13). A total of 810 cu. yd. of soil was removed from the Non-Hazardous Waste Storage Area for off property disposal (Ref. 7, p. 14). Following soil excavation, a work plan was implemented on behalf of Kimberly-Clark Corporation by Shaw to address three interrelated issues for which Ohio EPA had expressed concerns, which included the following:

- Direction of ground water flow across the Spinnaker property from Water Street to the Great Miami River;
- The breakdown of PCE in ground water entering the Spinnaker property from upgradient, off-site source(s) to the daughter products detected at the downgradient site boundary; and
- The concentrations of constituents of concern remaining in site soil after the 1995 remediation, specifically TCE (Ref. 7, pp. 10, 13, 14).

Based on the contamination detected in the soil samples collected in 2005, a contaminated soil source area was identified (Refs. 7, page 99, 100; 7A, p.1; 10, p. 1; Section 2.2.2 of this HRS documentation record). The estimated area of soil contamination is approximately 9,169.64 square feet (Ref. 10, p 1).

### **HAZARDOUS SUBSTANCE ASSOCIATED WITH THE SOURCE**

The soil sampling was performed by Shaw for Kimberly-Clark Corporation (Ref. 7, pp. 1, 10). The sampling was performed in March, April and May 2005 (Ref. 7, pp. 16-20). All soil samples were analyzed using same method (Ref. 7, pp. 18-21). All soil samples were analyzed using U. S. EPA Method 8260B (Ref. 7, pp. 18-21). The analysis of the soil sample was performed by TestAmerica, Inc. (Ref. 7, pp. 18-20). Hazardous substances associated with the contaminated soil are summarized in the table below. For each hazardous substance of concern, source and background concentrations are provided. Soil sample PSB-7 is utilized for the background sample (Ref. 7, pp. 40, 99). Contaminants detected in soil samples are at concentrations greater than their respective sample quantitation limits (Ref.



1, Table 2-3, p. 51589). Only hazardous substances in the source soil that meet this criterion are used to indicate hazardous substances associated with the source. Locations of soil samples are mapped in the Shaw October 2006, Supplemental Soil and Ground water Delineation Report for Spinnaker Coating Inc. Facility (the Spinnaker property) (Ref. 7, pp. 99, 100).

**Background Level:** A site-specific background sample was not designated during the sampling event. In order to characterize source 1 using chemical analysis, soil boring PSB-7 on the Spinnaker property was selected to represent background contaminant levels. This boring location was selected because the primary contaminants of concern - TCE, PCE, and cis-1,2-DCE - were not detected in the soil sample obtained from this location, and therefore, the soil boring PSB-7 is outside the influence of the soil contamination. Furthermore, the soil boring PSB-7 is located south of the area of known soil contamination. Background sample PSB-7 was collected from a depth of 12 to 13 feet (Ref. 7, pp. 16, 17, 40, 98, 113, 346, 347, 349, 355-357).

- Background Levels at Source 1 – Contaminated Soil Source Area

Background sample PSB-7 is from a depth of 12 to 13-feet depth and consists of silt and sand (Ref. 7, p. 40).

Sampling Location	Type and USCS Description	Depth (ft bgs)	Sample ID	Date	Hazardous Substance	MDL µg/kg	RL µg/kg	Hazardous Substance Concentration µg/kg	References
PSB-7	Soil; SM	12-13	PSB-7	04/01/05	cis-1,2-DCE PCE TCE	N/A N/A N/A	5.6 5.6 5.6	ND ND ND	Ref. 7, pp. 40, 113, 346, 347, 349, 355-357, 363-367

Notes:

USCS – Unified Soil Classification System

ft – feet

bgs – below ground surface

µg/kg – microgram per kilogram

SM – silty sand, sand-silt mixture

cis-1,2-DCE – cis-1,2-dichloroethene

PCE – tetrachloroethene

TCE – trichloroethene

RL – Reporting Limit

N/A – Not available

ND – non-detect

MDL – Method Detection Limit

- Contaminated Soil Samples at Source 1 – Contaminated Soil Source Area

One hundred and twenty-nine soil samples were analyzed for contaminants of concern (COCs) from forty one soil borings advanced at the site. Soil analytical results indicate the presence of chlorinated solvent compounds, most notably PCE, TCE and cis-1,2-DCE (Ref. 7, pp. 25, 26, 33). Laboratory QC sample results are presented in Reference 7, pages 363-367 and 422-433.

Sampling Location	Type and USCS Description	Depth (ft bgs)	Date	Hazardous Substance	MDL µg/kg	RL µg/kg	Hazardous Substance Concentration µg/kg	References
SSB-1	Soil; SM	1-2	5/2/2005	TCE	0.91	2.7	204	Ref. 7, pp. 42, 100, 118, 372, 373
SSB-1	Soil; CL	5-8	5/2/2005		0.91	2.7	105	Ref. 7, pp. 42, 100, 118, 372, 374
SSB-1	Soil; CL	8-10	5/2/2005		0.91	68	121	Ref. 7, pp. 42, 100, 118, 372, 375
SSB-1	Soil; CL	12-12.5	5/2/2005		0.91	68	2,190	Ref. 7, pp. 42, 100, 118, 372, 376
SSB-2	Soil; SP	2-5	5/2/2005		0.91	68	127	Ref. 7, pp. 42, 100, 119, 372, 379
SSB-2	Soil; CL	12.5-13	5/2/2005		0.91	68	98.5	Ref. 7, pp. 42, 100, 119, 372, 383
SSB-3	Soil; SP	2-3	5/2/2005		0.91	546	6,660	Ref. 7, pp. 42, 100, 120, 372, 385
SSB-3	Soil; SP	8-9.5	5/2/2005		0.91	273	386	Ref. 7, pp. 43, 100, 120, 372, 386
SSB-4	Soil; SP	1-5	5/2/2005		0.91	68	123	Ref. 7, pp. 43, 100, 121, 372, 389
SSB-4	Soil; SM	6-9	5/2/2005		0.91	68	87.1	Ref. 7, pp. 43, 100, 121, 372, 390
SSB-4	Soil; SM	9-10	5/2/2005		0.91	68	163	Ref. 7, pp. 43, 100, 121, 372, 391
SSB-4	Soil; SM	11-12.5	5/2/2005		0.91	68	308	Ref. 7, pp. 43, 100, 121, 372, 392
SSB-4	Soil; SM	12.5-14	5/2/2005		0.91	68	634	Ref. 7, pp. 43, 100, 121, 372, 393
SSB-4	Soil; SP	14-15	5/2/2005		0.91	68	193	Ref. 7, pp. 43, 100, 121, 372, 394
SSB-5	Soil; N/A	4-5	5/2/2005		0.91	68	661	Ref. 7, pp. 43, 100, 122, 372, 396
SSB-6	Soil; SM	3-5	5/3/2005	TCE	0.91	68	500	Ref. 7, pp. 44, 100, 123, 372, 403
SSB-6	Soil; CL	8-10	5/3/2005		0.91	68	114	Ref. 7, pp. 44, 100, 123, 372, 405
SSB-7	Soil; SP	2.5-4	5/3/2005		0.91	68	204	Ref. 7, pp. 44, 100, 124, 372, 415
SSB-7	Soil; SP	4-5	5/3/2005		0.91	68	158	Ref. 7, pp. 44, 100, 124, 372, 414
SSB-7	Soil; CL	9-10	5/3/2005		0.91	68	88.5	Ref. 7, pp. 45, 100, 124, 372, 412

Sampling Location	Type and USCS Description	Depth (ft bgs)	Date	Hazardous Substance	MDL µg/kg	RL µg/kg	Hazardous Substance Concentration µg/kg	References
SSB-7	Soil; SM	12-13	5/3/2005		0.91	68	178	Ref. 7, pp. 45, 100, 124, 372, 411
SSB-7	Soil; CL/SP	13-13.5	5/3/2005		0.91	68	182	Ref. 7, pp. 45, 100, 124, 372, 410
SSB-8	Soil; SM	3-5	5/3/2005		0.91	68	1,430	Ref. 7, pp. 45, 100, 125, 372, 419
SSB-8	Soil; SM	7.5-10	5/3/2005		0.91	68	591	Ref. 7, pp. 45, 100, 125, 372, 418
SSB-8	Soil; SP	12-12.5	5/3/2005		0.91	68	198	Ref. 7, pp. 45, 100, 125, 372, 417
SSB-8	Soil; CL	14-15	5/3/2005		0.91	68	1,190	Ref. 7, pp. 45, 100, 125, 372, 434
SSB-9	Soil; SP	4.5-5	5/3/2005		0.91	68	293	Ref. 7, pp. 45, 100, 126, 372, 435
SSB-9	Soil; CL	5-9	5/3/2005		0.91	2.7	615 E	Ref. 7, pp. 45, 100, 126, 372, 436
SSB-9	Soil; CL	9-10	5/3/2005		0.91	2.7	276	Ref. 7, pp. 46, 100, 126, 372, 438
SSB-9	Soil; CL	11.5-12	5/3/2005		0.91	2.7	231	Ref. 7, pp. 46, 100, 126, 372, 439
SSB-9	Soil; SP	12-14	5/3/2005		0.91	68	77.2	Ref. 7, pp. 46, 100, 126, 372, 466
SSB-9	Soil; CL	14-15	5/3/2005		0.91	68	98.4	Ref. 7, pp. 46, 100, 126, 372, 451
SSB-10	Soil; SP	4.5-5	5/3/2005		0.91	68	147	Ref. 7, pp. 46, 100, 127, 372, 452
SSB-10	Soil; CL	5-8	5/3/2005		0.91	68	88.5	Ref. 7, pp. 46, 100, 127, 372, 453
SSB-10	Soil; CL	8-10	5/3/2005		0.91	68	278	Ref. 7, pp. 46, 100, 127, 372, 454
SSB-10	Soil; SP	12-12.5	5/3/2005	TCE	0.91	68	451	Ref. 7, pp. 46, 100, 127, 372, 455
SSB-10	Soil; SP	12.5-14	5/3/2005		0.91	68	175	Ref. 7, pp. 46, 100, 127, 372, 456
SSB-11	Soil; CL	4-5	5/4/2005		0.91	68	72.7	Ref. 7, pp. 46, 100, 128, 372, 458
SSB-11	Soil; CL	8.5-10	5/4/2005		0.91	68	212	Ref. 7, pp. 47, 100, 128, 372, 460
SSB-11	Soil; CL	12.5-13	5/4/2005		0.91	68	2,250	Ref. 7, pp. 47, 100, 128, 372, 461
SSB-12	Soil; SM	3.5-5	5/4/2005		0.91	68	913	Ref. 7, pp. 47, 100, 129, 372, 463
SSB-12	Soil; SM	9-10	5/4/2005		0.91	68	2,210	Ref. 7, pp. 47, 100, 129, 372, 464
SSB-12	Soil; SM	12-13	5/4/2005		0.91	68	1,530	Ref. 7, pp. 47, 100, 129, 372, 465
SSB-12	Soil; SP	13-15	5/4/2005		0.91	68	68.6	Ref. 7, pp. 47, 100, 129, 372, 467
SSB-13	Soil; SP	4-5	5/4/2005		0.91	68	1,690	Ref. 7, pp. 47, 100, 130, 372, 468
SSB-13	Soil; SM	8-10	5/4/2005		0.91	68	918	Ref. 7, pp. 47, 100, 130, 372, 469

Sampling Location	Type and USCS Description	Depth (ft bgs)	Date	Hazardous Substance	MDL µg/kg	RL µg/kg	Hazardous Substance Concentration µg/kg	References
SSB-13	Soil; SP	11.5-12	5/4/2005		0.91	68	233	Ref. 7, pp. 47, 100, 130, 372, 470
SSB-13	Soil; CL	12-13	5/4/2005		0.91	68	5,890	Ref. 7, pp. 47, 100, 130, 372, 471
SSB-13	Soil; SP	13-15	5/4/2005		0.91	68	111	Ref. 7, pp. 47, 100, 130, 372, 472
SSB-14	Soil; SM	4-5	5/4/2005		0.91	68	2,050	Ref. 7, pp. 47, 100, 131, 372, 473
SSB-14	Soil; SM	5-9	5/4/2005		0.91	68	300	Ref. 7, pp. 48, 100, 131, 372, 474
SSB-14	Soil; CL	12-13	5/4/2005		0.91	68	12,800 E	Ref. 7, pp. 48, 100, 131, 372, 476
SSB-14	Soil; SP	13-15	5/4/2005		0.91	68	1,200	Ref. 7, pp. 48, 100, 131, 372, 477
SSB-17	Soil; SP	4-5	5/5/2005		0.91	68	1,650	Ref. 7, pp. 49, 100, 134, 372, 478
SSB-17	Soil; SM	8-9	5/5/2005		0.91	68	11,700 E	Ref. 7, pp. 49, 100, 134, 372, 479
SSB-17	Soil; CL	9-10	5/5/2005		0.91	68	511	Ref. 7, pp. 49, 100, 134, 372, 480
SSB-17	Soil; CL	12-13	5/5/2005		0.91	68	1,870	Ref. 7, pp. 49, 100, 134, 372, 481
SSB-18	Soil; SM	4-5	5/5/2005		0.91	137	3,510	Ref. 7, pp. 49, 100, 135, 372, 483
SSB-18	Soil; CL	8-9	5/5/2005		0.91	137	389	Ref. 7, pp. 49, 100, 135, 372, 484
SSB-18	Soil; CL	9-10	5/5/2005	TCE	0.91	137	1,240	Ref. 7, pp. 49, 100, 135, 372, 485
SSB-18	Soil; CL	13-14	5/5/2005		0.91	137	138	Ref. 7, pp. 49, 100, 135, 372, 486
SSB-20	Soil; SP	4-5	5/5/2005		0.91	137	11,800	Ref. 7, pp. 50, 100, 137, 372, 493
SSB-20	Soil; SM	8-10	5/5/2005		0.91	137	514	Ref. 7, pp. 50, 100, 137, 372, 494
PSB-20	Soil	2-4	4/1/2005		N/A	<1210	133,000	Ref. 7, pp. 40, 100, 291, 320, 322
PSB-22	Soil	13-14.5	3/30/2005		N/A	<373	38,400	Ref. 7, pp. 40, 100, 228, 243, 244
SSB-1	Soil; SM	1-2	5/2/2005	PCE	0.5	1.5	45.5	Ref. 7, pp. 42, 100, 118, 372, 373
SSB-1	Soil; CL	5-8	5/2/2005		0.5	1.5	27	Ref. 7, pp. 42, 100, 118, 372, 374
SSB-1	Soil; CL	8-10'	5/2/2005		0.5	38	42.1	Ref. 7, pp. 42, 100, 118, 372, 375
SSB-1	Soil; CL	12-12.5	5/2/2005		0.5	38	562	Ref. 7, pp. 42, 100, 118, 372, 376
SSB-1	Soil; CL	12.5-13	5/2/2005		0.5	38	116	Ref. 7, pp. 42, 100, 118, 372, 377
SSB-2	Soil; CL	12-12.5	5/2/2005		0.5	38	38.8	Ref. 7, pp. 42, 100, 119, 372, 382
SSB-2	Soil; CL	12.5-13	5/2/2005		0.5	38	87	Ref. 7, pp. 42, 100, 119, 372, 383

Sampling Location	Type and USCS Description	Depth (ft bgs)	Date	Hazardous Substance	MDL µg/kg	RL µg/kg	Hazardous Substance Concentration µg/kg	References
SSB-2	Soil; SP	13-15	5/2/2005		0.5	38	52.4	Ref. 7, pp. 42, 100, 119, 372, 384
SSB-4	Soil; SP	14-15	5/2/2005		0.5	38	60.7	Ref. 7, pp. 43, 100, 121, 372, 394
SSB-5	Soil; N/A	4-5	5/2/2005		0.5	38	51.1	Ref. 7, pp. 43, 100, 122, 372, 396
SSB-6	Soil; SM	3-5	5/3/2005		0.5	38	98.8	Ref. 7, pp. 44, 100, 123, 372, 403
SSB-6	Soil; CL	5-8	5/3/2005		0.5	38	48.3	Ref. 7, pp. 44, 100, 123, 372, 404
SSB-6	Soil; CL	8-10	5/3/2005		0.5	38	56.2	Ref. 7, pp. 44, 100, 123, 372, 405
SSB-7	Soil; SP	2.5-4	5/3/2005		0.5	38	63.3	Ref. 7, pp. 44, 100, 124, 372, 415
SSB-7	Soil; SP	4-5	5/3/2005		0.5	38	146	Ref. 7, pp. 44, 100, 124, 372, 414
SSB-7	Soil; CL	5-9	5/3/2005		0.5	38	81.7	Ref. 7, pp. 45, 100, 124, 372, 413
SSB-7	Soil; CL	9-10	5/3/2005		0.5	38	244	Ref. 7, pp. 45, 100, 124, 372, 412
SSB-7	Soil; SM	12-13	5/3/2005		0.5	38	96.8	Ref. 7, pp. 45, 100, 124, 372, 411
SSB-7	Soil; CL/SP	13-13.5	5/3/2005	PCE	0.5	38	215	Ref. 7, pp. 45, 100, 124, 372, 410
SSB-7	Soil; SP	13.5-14	5/3/2005		0.5	38	71.9	Ref. 7, pp. 44, 100, 124, 372, 421
SSB-8	Soil; SM	3-5	5/3/2005		0.5	38	95.2	Ref. 7, pp. 45, 100, 125, 372, 419
SSB-8	Soil; SM	7.5-10	5/3/2005		0.5	38	47	Ref. 7, pp. 45, 100, 125, 372, 418
SSB-8	Soil; SP	12-12.5	5/3/2005		0.5	38	41.2	Ref. 7, pp. 45, 100, 125, 372, 417
SSB-8	Soil; SP	12.5-14	5/3/2005		0.5	38	135	Ref. 7, pp. 45, 100, 125, 372, 416
SSB-8	Soil; CL	14-15	5/3/2005		0.5	38	661	Ref. 7, pp. 45, 100, 125, 372, 434
SSB-9	Soil; SP	4.5-5	5/3/2005		0.5	1.5	10.6	Ref. 7, pp. 45, 100, 126, 372, 435
SSB-9	Soil; CL	5-9	5/3/2005		0.5	1.5	19.8	Ref. 7, pp. 45, 100, 126, 372, 436
SSB-9	Soil; CL	9-10	5/3/2005		0.5	1.5	17.3	Ref. 7, pp. 46, 100, 126, 372, 438
SSB-9	Soil; CL	11.5-12	5/3/2005		0.5	1.5	10.4	Ref. 7, pp. 46, 100, 126, 372, 439
SSB-9	Soil; SP	12-14	5/3/2005		0.5	38	125	Ref. 7, pp. 46, 100, 126, 372, 466
SSB-10	Soil; CL	8-10	5/3/2005		0.5	38	97	Ref. 7, pp. 46, 100, 127, 372, 454
SSB-10	Soil; SP	12-12.5	5/3/2005		0.5	38	74.3	Ref. 7, pp. 46, 100, 127, 372, 455
SSB-10	Soil; SP	12.5-14	5/3/2005		0.5	38	144	Ref. 7, pp. 46, 100, 127, 372, 456



Sampling Location	Type and USCS Description	Depth (ft bgs)	Date	Hazardous Substance	MDL µg/kg	RL µg/kg	Hazardous Substance Concentration µg/kg	References
SSB-11	Soil; CL	4-5	5/4/2005		0.5	38	77.2	Ref. 7, pp. 46, 100, 128, 372, 458
SSB-11	Soil; CL	8.5-10	5/4/2005		0.5	38	97.4	Ref. 7, pp. 47, 100, 128, 372, 460
SSB-11	Soil; CL	12.5-13	5/4/2005		0.5	38	347	Ref. 7, pp. 47, 100, 128, 372, 461
SSB-12	Soil; SM	3.5-5	5/4/2005		0.5	38	39	Ref. 7, pp. 47, 100, 129, 372, 463
SSB-12	Soil; SM	9-10	5/4/2005		0.5	38	59.4	Ref. 7, pp. 47, 100, 129, 372, 464
SSB-12	Soil; SM	12-13	5/4/2005		0.5	38	59.3	Ref. 7, pp. 47, 100, 129, 372, 465
SSB-13	Soil; SP	4-5	5/4/2005		0.5	38	127	Ref. 7, pp. 47, 100, 130, 372, 468
SSB-13	Soil; CL	12-13	5/4/2005		0.5	38	58.7	Ref. 7, pp. 47, 100, 130, 372, 471
SSB-14	Soil; SM	4-5	5/4/2005		0.5	38	108	Ref. 7, pp. 47, 100, 131, 372, 473
SSB-14	Soil; SM	5-9	5/4/2005	PCE	0.5	38	44.4	Ref. 7, pp. 48, 100, 131, 372, 474
SSB-14	Soil; CL	12-13	5/4/2005		0.5	38	158	Ref. 7, pp. 48, 100, 131, 372, 476
SSB-14	Soil; SP	13-15	5/4/2005		0.5	38	92.6	Ref. 7, pp. 48, 100, 131, 372, 477
SSB-15	Soil; SP	4-5	5/4/2005		0.5	38	733	Ref. 7, pp. 47, 100, 132, 372, 440
SSB-15	Soil; CL	5-8	5/4/2005		0.5	38	91.7	Ref. 7, pp. 48, 100, 132, 372, 441
SSB-15	Soil; CL	8-10	5/4/2005		0.5	38	88.6	Ref. 7, pp. 48, 100, 132, 372, 442
SSB-15	Soil; SP	12-13	5/4/2005		0.5	38	73.1	Ref. 7, pp. 48, 100, 132, 372, 444
SSB-15	Soil; SP	13-15	5/4/2005		0.5	38	96.4	Ref. 7, pp. 48, 100, 132, 372, 445
SSB-17	Soil; SP	4-5	5/5/2005		0.5	38	57.5	Ref. 7, pp. 49, 100, 134, 372, 478
SSB-17	Soil; SM	8-9	5/5/2005		0.5	38	931	Ref. 7, pp. 49, 100, 134, 372, 479
SSB-17	Soil; CL	9-10	5/5/2005		0.5	38	132	Ref. 7, pp. 49, 100, 134, 372, 480
SSB-17	Soil; CL	12-13	5/5/2005		0.5	38	757	Ref. 7, pp. 49, 100, 134, 372, 481
SSB-18	Soil; SM	4-5	5/5/2005		0.5	75	75.8	Ref. 7, pp. 49, 100, 135, 372, 483
SSB-18	Soil; CL	9-10	5/5/2005		0.5	75	177	Ref. 7, pp. 49, 100, 135, 372, 485
SSB-20	Soil; SP	4-5	5/5/2005		0.5	75	134	Ref. 7, pp. 50, 100, 137, 372, 493
SSB-4	Soil; SM	12.5-14	5/2/2005	Cis-1,2 DCE	1.44	108	284	Ref. 7, pp. 43, 100, 121, 372, 393
SSB-9	Soil; SP	4.5-5	5/3/2005		1.44	4.3	6.1	Ref. 7, pp. 45, 100, 126, 372, 435

Sampling Location	Type and USCS Description	Depth (ft bgs)	Date	Hazardous Substance	MDL $\mu\text{g/kg}$	RL $\mu\text{g/kg}$	Hazardous Substance Concentration $\mu\text{g/kg}$	References
SSB-13	Soil; CL	12-13	5/4/2005		1.44	108	1,790	Ref. 7, pp. 47, 100, 130, 372, 471
SSB-14	Soil; CL	12-13	5/4/2005		1.44	108	391	Ref. 7, pp. 48, 100, 131, 372, 476
SSB-17	Soil; SP	4-5	5/5/2005		1.44	108	240	Ref. 7, pp. 49, 100, 134, 372, 478
SSB-18	Soil; SM	4-5	5/5/2005		1.44	216	282	Ref. 7, pp. 49, 100, 135, 372, 483
SSB-18	Soil; SP	8-9	5/5/2005		1.44	216	610	Ref. 7, pp. 49, 100, 135, 372, 484
SSB-18	Soil; CL	9-10	5/5/2005		1.44	216	882	Ref. 7, pp. 49, 100, 135, 372, 485
SSB-18	Soil; CL	13-14	5/5/2005		1.44	216	262	Ref. 7, pp. 49, 100, 135, 372, 486
PSB-20	Soil	2-4	4/1/2005	Cis-1,2 DCE	N/A	<6	170	Ref. 7, pp. 40, 99, 290, 320, 322
PSB-21	Soil	14-16	4/1/2005		N/A	<45	405	Ref. 7, pp. 40, 99, 287, 320, 322
PSB-22	Soil	13-14.5	3/30/2005		N/A	<373	14,900	Ref. 7, pp. 40, 99, 227, 243, 244

Notes:

E- The concentration found in the sample exceeds the calibration range of the instrument. Results are estimated and should be considered minimum values for the compounds reported (Ref. 7, p. 372).

USCS – Unified Soil Classification system

ft – feet

bgs – below ground surface

$\mu\text{g/kg}$  – micrograms per kilogram

MDL – Method Detection Limit

RL – Reporting Limit

CL – clay, gravelly clay, sandy clay, silty clay, low to medium plasticity

SM – silty sand, sand-silt mixture

SP – poorly graded sands, gravelly sands, little or no fines

cis-1,2-DCE – cis-1,2-dichloroethene

PCE – tetrachloroethene

TCE – trichloroethene

N/A – Not available on laboratory data sheets

ND – non-detect

### 2.2.1 HAZARDOUS SUBSTANCES AVAILABLE TO A PATHWAY

The soil borings installed at the site have shown that a liner, maintained engineered cover, functioning and maintained run-on control system, runoff management system, or functioning leachate collection and removal system are absent. Therefore, the Containment Factor Value (CFV) for Source 1 was assigned a maximum value of 10 (Refs. 1, Section 3.1.2.1, Table 3-2, p. 51596; 7, pp. 106-145; 8, pp. 116-129; 9, 38-55; 25, pp. 2, 3). The maximum CFV reflects the minimum level of containment. Sources are

assigned a maximum CFV if there is evidence that hazardous substances have migrated from the source area or that there is no liner, maintained engineered cover, functioning leachate collection and removal system, or functioning and maintained run-on control system or runoff management system (Ref. 1, Section 3.1.2.1, Table 3-2, pp. 51595, 51596).

Source 1 is contaminated soil. As discussed above, an observed release to the soil has occurred. Because the CFV for Source 1 is greater than zero, the following substances associated with the source area are available to migrate via the ground water pathway: TCE, PCE, and cis-1,2-DCE.

<b>Containment Description</b>	<b>Containment Factor Value</b>	<b>Reference</b>
Gas Release to Air	Not Scored	Not Applicable
Particulate Release to Air	Not Scored	Not Applicable
Release to Ground Water	10	1, Section 3.1.2.1, Table 3-2, p. 51596; 7, pp. 106-145; 8, pp. 116-129; 9, pp. 38-55
Release through Overland Migration or Flood	Not Scored	Not Applicable

## **HAZARDOUS WASTE QUANTITY**

### **2.4.2.1 Source Hazardous Waste Quantity**

#### **2.4.2.1.1 Hazardous Constituent Quantity (Tier A)**

The information available is not sufficient to adequately determine Tier A, as required in Section 2.4.2.1.1 of the HRS Rule. As a result, the evaluation of Source Hazardous Waste Quantity proceeds to the evaluation of Tier B, hazardous waste stream quantity (Ref. 1, Section 2.4.2.1.1, pp. 51590-51591).

#### **2.4.2.1.2 Hazardous Wastestream Quantity (Tier B)**

The information available is not sufficient to adequately determine Tier B, as required in Section 2.4.2.1.2 of the HRS Rule. As a result, the evaluation of Source Hazardous Waste Quantity proceeds to the evaluation of Tier C, volume (Ref. 1, Section 2.4.2.1.2, p. 51591).

#### 2.4.2.1.3 Volume (Tier C)

The information available is not sufficient to adequately determine Tier C, as required in Section 2.4.2.1.3 of the HRS Rule. As a result, a value of 0 is assigned for volume and the evaluation of Source Hazardous Waste Quantity proceeds to the evaluation of Tier D, area (Ref. 1, Section 2.4.2.1.3, p. 51591).

#### 2.4.2.1.4 Area (Tier D)

Contaminated soil area was determined through sampling for Source 1. Based on the sampling data, the contaminated soil area was determined to be 9,169.64 ft<sup>2</sup> (Ref. 10, p. 1). Using the equation from Table 2-5 (Ref. 1, p. 51591), the area value was calculated by dividing the area of the hazardous waste, 9,169.64 ft<sup>2</sup> by 34,000 (Equation for assigning value for contaminated soil), resulting in hazardous waste quantity value for area (Tier D) of 0.3 (Ref. 1, Section 2.4.2.1.4, p. 51591). Therefore, the Source 1 Hazardous Waste Quantity Value is 0.3.

#### 2.4.2.1.5 Calculation of Source Hazardous Waste Quantity Value

As described in the HRS Rule, the highest value assigned to a source from among the four tiers of hazardous waste quantity - constituent quantity (Tier A), wastestream quantity (Tier B), volume (Tier C) or area (Tier D) - shall be selected as the source hazardous waste quantity value (Ref. 1, Section 2.4.2.1.5, p. 51591). Source 1 has Source Hazardous Waste Quantity Value of 0.3.

#### HAZARDOUS WASTE QUANTITY VALUE

Source 1 Hazardous Waste Quantity	
Tier Measure	Source Value
Tier A, Hazardous Constituent Quantity	Not Scored
Tier B, Hazardous Wastestream Quantity	Not Scored
Tier C, Volume	0
Tier D, Area	0.3

## 2.2.2 SOURCE IDENTIFICATION

Source Number: 2

Source Type: Other – Ground Water Plume with no identified sources.

Description and Location of Source (with reference to a map of the site)

Source 2 is a PCE contaminated ground water plume with no identified source. Source 2 is associated with the area of PCE contaminated ground water that is upgradient of and extends under the Spinnaker property. Figures 2 and 3 of this HRS documentation record show the location of the East Troy Contaminated Aquifer.

During the Integrated Site Assessment, Ohio EPA advanced 6 soil borings, collected 18 ground water samples directly from the boreholes; installed 2 monitoring wells; and collected 25 ground water samples from monitoring wells, treatment wells and municipal production wells (Ref. 8, pp. 1, 8-14, 22). During the ESI, Ohio EPA advanced 20 soil borings, collected 19 ground water samples from temporary well screens in the boreholes, and installed and sampled 4 monitoring wells (Ref. 9, pp. 7, 9, 10, 26). The investigation was performed to delineate the pathways by which the VOCs are entering the East Troy Well Field (Ref. 9, pp. 6, 7, 25). VOCs, primarily PCE, were detected in the ground water samples from both of these OEPA sampling events (Refs. 8, p. 17; 9, pp. 21-22, 87, 91). Ground water from temporary monitoring wells and permanent monitoring wells have shown to be contaminated with primary contaminants of concern PCE; TCE; cis-1,2 DCE; and vinyl chloride (Ref. 9, pp. 34-36). Four monitoring locations have exceeded the 5 micrograms per liter (µg/L) MCL for PCE; two monitoring locations have exceeded the 5 µg/L MCL for TCE; and one location has exceeded the 2 µg/L MCL for vinyl chloride (Refs. 8, pp. 5, 9-14, 16-17; 9, pp. 6, 8, 10-12, 14, 31, 32, 34-36). The ground water samples collected during March 2007 have shown that two municipal wells in the City of Troy, PW-14 and PW-18, have been impacted with cis-1,2-DCE (Ref. 14, pp. 12, 14). Cis-1,2-DCE was detected at estimated concentrations in both municipal wells (Refs. 8, pp. 5, 7, 10, 14, 16, 17, 111, 113; 14, pp. 12, 14; 35). Historically cis-1,2-DCE has been detected at estimated concentrations in these wells (Refs. 5, pp. 2, 4; 8, pp. 7, 10, 14, 16, 17, 111, 113; 9, pp. 8, 14, 25-26; 13, pp. 7, 10-11, 664; 14, pp. 12, 14; 35). The full extent of the ground water plume and sources contributing to the ground water contamination has not been determined.



### **2.2.3 HAZARDOUS SUBSTANCES ASSOCIATED WITH THE SOURCE**

The ground water sampling was performed by OEPA during June 2002 and March 2007 (Refs. 9, p. 7; 14, p. 1). Ground water samples were analyzed using U. S. EPA Method 8260B (Ref. 9, p. 7; 14, p. 5). The analysis of the March 2007 ground water samples was performed by Kemron Environmental Inc. (Ref. 14, pp. 2-146). The principal hazardous substances associated with Source 2 are summarized in the table below. For each of these hazardous substances, background and source/release concentrations are provided. All ground water samples were collected from the unconsolidated aquifer (Ref. 7, pp. 11, 12, 106-145; 8, pp. 10, 116-129; 9, pp. 12, 13, 38-59). The screened interval of the temporary and permanent monitoring wells is 8-30 ft below ground surface (bgs) (See Section 3.1.1 of this HRS documentation record). The depth of the municipal wells is 68 to 124 feet bgs (Ref. 4, pp. 2, 3).

#### **Background Level:**

Based on the ground water flow direction of southwest to northeast Geoprobe locations GP10 and GP11 are considered to be upgradient locations (Refs. 7, pp. 30, 34, 101, 102; 9, p. 13; 12A, pp. 50, 54, 64). For the East Troy Contaminated Aquifer plume, the contaminants of concern were non-detect in background samples for VOCs, including PCE; TCE; cis-1,2-DCE; and vinyl chloride (Ref. 9, pp. 35, 37, 72, 73, 84, 93, 94). The samples were collected at a depth of 16 feet from GP10 and for 20 feet for GP11 (Refs. 9, p. 35; 25, pp. 2, 3).

Figure 3 of this HRS documentation record shows the approximate extent of the East Troy Contaminated Aquifer.

#### **-Background Level at Source 2 – Contaminant Plume**

Based on the ground water flow direction of southwest to northeast, wells GP-10 and GP-11 are located upgradient of Source 2 (Refs. 7, pp. 30, 34, 101, 102; 9, pp. 13, 37; 12A, pp. 50, 54, 64; 29). The locations of these wells are shown on Figure 3 of the Expanded Site Inspection Report (Ref. 9, pp. 19, 37). These wells are included in the table below.

## BACKGROUND WELL INFORMATION

Well Code	Well Depth (ft bgs)	Well Screen Length (ft)	Hazardous Substance	Laboratory Sample No.	Sample Date	Concentration Detected (µg/L)	MDL (µg/L)	RL (µg/L)	References
GP10	16	10	PCE	GP10GW01	6/12/02	ND	N/A	1	Refs. 9, pp. 28, 35, 72, 84, 92; 25, pp. 2, 4, 5
			TCE			ND	N/A	1	
			VC			ND	N/A	1	
GP11	22	10	PCE	GP11GW01	6/12/02	ND	N/A	1	Ref. 9, pp. 28, 35, 73, 84, 93, 94; 25, p. 3
			TCE			ND	N/A	1	
			Cis-1,2-DCE			ND	N/A	0.5	
			VC			ND	N/A	1	

Notes:

MDL – Method Detection Limit

RL: - Reporting Limit

bgs – below ground surface

ft – feet

µg/L – micrograms per liter

cis-1,2-DCE – cis-1,2-dichloroethene

PCE – tetrachloroethene

TCE – trichloroethene

VC – vinyl chloride

N/A – not applicable/not reported on the data sheets

ND – non-detect

- Contaminated Samples at Source 2 – Contaminated Plume

The contaminated well information is provided in the table below.

## CONTAMINATED WELL INFORMATION

Well Code	Aquifer	Well Depth (ft bgs)	Well Screen Length (ft)	Laboratory Sample No.	Sample Date	Hazardous Substance	Concentration Detected (µg/L)	MDL (µg/L)	RL (µg/L)	References
GP01	UC	20	10	GP01GW01	6/11/2002	PCE	18	N/A	1	Ref. 9, pp. 28, 33, 34, 38, 63, 83, 125; 30, p.1
GP02	UC	20	10	GP02GW01	6/11/2002	PCE	2	N/A	1	Ref. 9, pp. 28, 33, 34, 39, 64, 83, 127; 30, p.1
GP03	UC	20	10	GP03GW01	6/11/2002	TCE	34		1	Ref. 9, pp. 28, 33, 34, 40, 65, 83, 133;

Well Code	Aquifer	Well Depth (ft bgs)	Well Screen Length (ft)	Laboratory Sample No.	Sample Date	Hazardous Substance	Concentration Detected (µg/L)	MDL (µg/L)	RL (µg/L)	References
										30,p.1
GP06	UC	20	10	GP06GW01	6/11/2002	cis-1,2-DCE	3.6	N/A	0.5	Ref. 9, pp. 33, 28,34, 43, 68, 84, 86; 30, p.1
GP07	UC	20	10	GP07GW01	6/12/2002	PCE	78	N/A	2.5	Ref. 9, pp. 33, 28,34, 44, 69, 84, 91 ; 30, p.1
						TCE	5.8		2.5	
GP13	UC	20	10	GP13GW01	6/12/2002	VC	6.6	N/A	1.9	Ref. 9, pp. 28, 33, 35, 47, 75, 85, 102; 30, p.1
GP16	UC	24	10	GP16GW01	6/13/2002	PCE	53	N/A	2.0	Ref. 9, pp. 28, 33, 35, 49, 78, 85, 112; 30, p.1
GP17	UC	20	10	GP17GW01	6/13/2002	TCE	2.5	N/A	2.0	Ref. 9, pp. 33, 36, 51, 79, 85, 113, 114; 30, p.1
						cis-1,2-DCE	62	N/A	1.0	
KMW-16	UC	21	10	L0703719-02	3/28/2007	TCE	3.72	0.25	1.0	Ref. 14, pp. 2-6, 9, 133; 7, p. 144; 30, p.1
						cis-1,2-DCE	1.64	0.25	1.0	
RS-04	UC			L0703719-03	3/28/2007	cis-1,2-DCE	6.09	0.25	1.0	Ref. 14, pp. 2-6, 11, 133; 30, p.1
OEPA3	UC	25	10	L0703719-06	3/28/2007	cis-1,2-DCE	1.20	0.25	1.0	Ref. 14, pp. 2-6, 16, 133; 9, p. 58; 30, p.1;
KMW-08	UC	30.5	20	L0703719-07	3/28/2007	TCE	4.68	0.25	1.0	Ref. 14, pp. 2-6, 18, 133; 17, p. 470
						cis-1,2-DCE	16	0.25	1.0	Ref. 14, pp. 2-6, 17, 133; 17, p. 470; 30, p.1
						VC	1.36	0.25	1.0	Ref. 14, pp. 2-6, 18, 133; 17, p. 470; 30, p.1

Well Code	Aquifer	Well Depth (ft bgs)	Well Screen Length (ft)	Laboratory Sample No.	Sample Date	Hazardous Substance	Concentration Detected (µg/L)	MDL (µg/L)	RL (µg/L)	References
KMW-09	UC	30	20	L0703719-09	3/28/2007	TCE	5.92	0.25	1.0	Ref. 14, pp. 2-6, 21, 133; 17, p. 471; 30, p.1
EEIB12	UC	23	10	L0703719-14	3/28/2007	TCE	3.65	0.25	1.0	Ref. 14, pp. 2-6, 29, 133; 15, p.12; 30, p.1
						cis-1,2-DCE	1.8	0.25	1.0	Ref. 14, pp. 2-6, 29, 133; 30, p.1
KMW-07	UC	20.5	10	L0703719-15	3/28/2007	PCE	7.78	0.25	1.0	Ref. 14, pp. 2-6, 31, 133; 17, p. 469; 30, p.1
GZA1	UC	18	10	L0703719-17	3/28/2007	PCE	14.4	0.25	1.0	Ref. 14, pp. 2-6, 34, 133; 17, p. 495; 30, p.1
EEIB4	UC	21	10	L0703719-18	3/28/2007	PCE	14.6	0.25	1.0	Ref. 14, pp. 2-6, 36, 133; 15, p. 6; 30, p.1
						cis-1,2-DCE	1.05	0.25	1.0	
KMW5	UC	20.5	10	L0703719-19	3/28/2007	PCE	2.95	0.25	1.0	Ref. 14, pp. 2-6, 38, 133, 155; 17, p. 467; 30, p.1
KMW11	UC	21.5	10	L0703719-21	3/29/2007	cis-1,2-DCE	45.9	0.25	1.0	Ref. 14, pp. 2-6, 41, 134; 7, p. 139
KMW10	UC	20.5	10	L0703719-22	3/29/2007	cis-1,2-DCE	69.1	0.25	1.0	Ref. 14, pp. 2-6, 42, 134; 7, p. 138; 30, p.1
KMW15	UC	22	10	L0703719-23	3/29/2007	TCE	4.83	0.25	1.0	Ref. 14, pp. 2-6, 44, 134; 7, p.143; 30, p.1

Well Code	Aquifer	Well Depth (ft bgs)	Well Screen Length (ft)	Laboratory Sample No.	Sample Date	Hazardous Substance	Concentration Detected (µg/L)	MDL (µg/L)	RL (µg/L)	References
KMW14	UC	20	10	L0703719-24	3/29/2007	PCE	1.17	0.25	1.0	Ref. 14, pp. 2-6, 46, 134; 7, p.142; 30, p.1
						cis-1,2-DCE	3.77	0.25	1.0	
EEIB2	UC	21	10	L0703719-26	3/29/2007	TCE	1.5	0.25	1.0	Ref. 14, pp. 2-6, 49, 134; 15, p.5; 30, p.1
						cis-1,2-DCE	2.38	0.25	1.0	
PW3	UC	31	15	L0703719-28	3/29/2007	TCE	1.05	0.25	1.0	Ref. 14, pp. 2-6, 53, 134; 17, p. 474; 30, p.1
						cis-1,2-DCE	11.7	0.25	1.0	Ref. 14, pp. 2-6, 52, 134; 17, p. 474; 30, p.1
						VC	1.96	0.25	1.0	Ref. 14, pp. 2-6, 53, 134; 17, p. 474; 30, p.1
PW4	UC	30	15	L0703719-29	3/29/2007	TCE	1.46	0.25	1.0	Ref. 14, pp. 2-6, 54, 134; 17, p. 475; 30, p.1
						cis-1,2-DCE	2.50	0.25	1.0	

Notes:

UC – Unconsolidated Aquifer (upper and lower aquifer are hydraulically connected)

RL – Reporting Limit

MDL – Method Detection Limit

µg/L – micrograms per liter

cis-1,2-DCE – cis-1,2-dichloroethene

PCE – tetrachloroethene

TCE – trichloroethene

VC – Vinyl chloride

N/A – Not available on laboratory data sheets

ND – non-detect

## 2.2.4 HAZARDOUS SUBSTANCES AVAILABLE TO A PATHWAY

Evidence of ground water release of hazardous constituents from an unknown source has been documented based on chemical analysis (See Sections 2.2.2 and 3.1.1 of this HRS documentation record). Therefore, the Containment Factor Value (CFV) for Source 2 was assigned a maximum value of 10 (Refs. 1, Section 3.1.2.1, Table 3-2, pp. 51595, 51596; 7, pp. 106-145; 8, pp. 116-129; 9, 38-59; 25, pp. 2, 3).

The maximum CFV reflects the minimum level of containment. Sources are assigned a maximum CFV if there is evidence that hazardous substances have migrated from the source area or that there is no liner, maintained engineered cover, functioning leachate collection and removal system, or functioning and maintained run-on control system or runoff management system (Ref. 1, Section 3.1.2.1, Table 3-2, p. 51596).

As discussed above, an observed release to the ground water pathway is documented. Because the CFV for Source 2 is greater than zero, the following substances are identified to have been released via the ground water migration pathway: TCE; PCE; cis-1,2-DCE; and vinyl chloride. Therefore, it would be appropriate to assign a containment value of 10 for Source 2 because of evidence of a release of hazardous substances.

<b>Containment Description</b>	<b>Containment Factor Value</b>	<b>Reference</b>
Gas Release to Air	Not Scored	Not Applicable
Particulate Release to Air	Not Scored	Not Applicable
Release to Ground Water	10	1, Section 3.1.2.1, Table 3-2, p. 51596; 7, pp. 106-145; 8, pp. 116-129; 9, 38-59
Release through Overland Migration or Flood	Not Scored	Not Applicable

## **HAZARDOUS WASTE QUANTITY**

### **2.4.2.1 Source Hazardous Waste Quantity**

#### **2.4.2.1.1 Hazardous Constituent Quantity (Tier A)**

The information available is not sufficient to adequately determine Tier A, as required in Section 2.4.2.1.1 of the HRS Rule. As a result, the evaluation of Source Hazardous Waste Quantity proceeds to the evaluation of Tier B, hazardous waste stream quantity (Ref. 1, Section 2.4.2.1.1, pp. 51590-51591).

#### **2.4.2.1.2 Hazardous Wastestream Quantity (Tier B)**

The information available is not sufficient to adequately determine Tier B, as required in Section 2.4.2.1.2 of the HRS Rule. As a result, the evaluation of Source Hazardous Waste Quantity proceeds to the evaluation of Tier C, volume (Ref. 1, Section 2.4.2.1.2, p. 51591).

#### 2.4.2.1.3 Volume (Tier C)

Based on sampling data, the contaminated ground water plume extends upgradient and beneath the Spinnaker property. The extent of ground water contamination and all sources specifically upgradient of Spinnaker property have not been identified. Therefore, for Source 2 a value of greater than zero has been assigned for the hazardous waste quantity value for volume (Tier C) (Ref. 1, Section 2.4.2.1.3, Table 2-6, p. 51591).

#### 2.4.2.1.4 Area (Tier D)

Area, Tier D, is not evaluated for source type “other” (Ref. 1, Table 2-6).

#### 2.4.2.1.5 Calculation of Source Hazardous Waste Quantity Value

As described in the HRS Rule, the highest value assigned to a source from among the four tiers of hazardous waste quantity - constituent quantity (Tier A), wastestream quantity (Tier B), volume (Tier C) or area (Tier D) - shall be selected as the source hazardous waste quantity value (Ref. 1, Section 2.4.2.1.5, p. 51591). Source 2 has a Source Hazardous Waste Quantity Value of unknown but greater than 0.

#### HAZARDOUS WASTE QUANTITY VALUE

Source 2 Hazardous Waste Quantity	
Tier Measure	Source Value
Tier A, Hazardous Constituent Quantity	Not Scored
Tier B, Hazardous Wastestream Quantity	Not Scored
Tier C, Volume	Unknown but >0
Tier D, Area	0

#### SUMMARY OF SOURCE DESCRIPTIONS

Source Number	Source Hazardous Waste Quantity Value	Source Hazardous Constituent Quantity Complete (Y/N)	Containment Factor Value by Pathway				
			GW	SW		Air	
			(Table 3-2)	Overland/ Flood (Table 4-2)	GW to SW (Table 3-2)	Gas (Table 6-3)	Particulate (Table 6-9)
1	0.3	N	10	NS	NS	NS	NS
2	>0	N	10	NS	NS	NS	NS

Notes:

GW – Ground water

SW – Surface water

NS – Not Scored

### 3.0 GROUND WATER MIGRATION PATHWAY

#### 3.0.1 GENERAL CONSIDERATIONS

##### Regional Geology

Unconsolidated glacial deposits, overlying Paleozoic bedrock, characterize the geology of the Troy area. The glacial deposits vary from clay- to gravel-sized material and typically range in thickness from 20 to 40 feet. In areas where erosional features (valleys) were developed on the older bedrock surface, the overlying glacial deposits are thicker. Most of the City of Troy, including the City's east well field, is underlain by these buried bedrock valleys where glacial deposits range up to 200-250 feet thick. Bedrock valleys acted as drainage basins during glacial periods and subsequently filled with permeable sand and gravel deposits that formed productive aquifers (Refs. 7, p. 11; 12A, pp. 17, 19-21; 29).

The glacial deposits in the Troy area are immediately underlain by Silurian- or Ordovician-age bedrock. Some of these deposits are contained in a valley that has been carved by a tributary to the ancient Teays River system. This valley, which is referred to as a *buried valley*, is roughly coincident with the topographic valley formed by the present-day Great Miami River. Glacial deposits in the buried valley consist primarily of permeable sand and gravel-rich outwash or less permeable clay- and silt-rich till. Beyond the margins of buried valleys, the glaciers deposited a mantle of sediment over the bedrock consisting predominantly of till. To the east and west of Troy, this till averages between 20 to 40 feet thick (Refs. 12A, p. 18; 27, p. 23; 29).

##### Regional Hydrogeology

Where the outwash deposits are sufficiently thick and have an adequate source of recharge, such as the Great Miami River, they form the primary aquifers for municipal water supplies in the Miami Valley region. In Troy, a lower-permeability till unit generally divides the outwash units into two aquifers, upper and lower (Refs. 12A, p. 18; 29). Ground water flow in the upper aquifer is from southwest to northeast toward the Great Miami River on the west side of Brown-Bridge. On the east side of the facility, ground water moves in a more west-northwest to east-northeast direction toward the River (the Great Miami River turns from southeast to south-southeast downstream of Brown-Bridge, resulting in the slight change in ground water flow direction from the west side to the east side of the facility). Ground water in this shallow aquifer discharges to the Great Miami River (Ref. 27, pp. 24-25, 54-56, 60-67).



## Site-Specific Hydrogeology

Glacial deposits in the Troy area are divided into an upper outwash and a lower outwash aquifer, which are separated by a lower-permeability unit. The upper aquifer is typically 10 to 40 feet (Refs. 7, pp. 11, 106-145; 8, pp. 116-121, 123, 128, 129; 15, pp. 36, 38, 40-93; 29). The lower aquifer is thicker than the upper aquifer and consists of buried bedrock valley sand and gravel deposits (Refs. 7, p. 11; 8, 122, 124-127). The lower aquifer has more interbeds of silt and clay; as a result, its bulk water-transmitting capabilities are generally less than the upper aquifer (Refs. 12A, p. 19; 29). The lower-permeability unit has considerable variability in depth and thickness, but in the area of Troy's east well field is typically found at depths between 70 and 100 feet below ground surface (bgs) and ranges in thickness from 5 to 25 feet (Refs. 4, p. 3; 7, p. 11; 8, pp. 122, 124-127).

The buried bedrock valley sand and gravel (lower) aquifer, which supplies the City of Troy with ground water, is a prolific water source. Production wells in this aquifer can produce more than 1,000 gallons per minute (Refs. 4, p. 5; 27, p. 23). The City's wells are typically 68 to 124 feet deep and produce from a sand and gravel aquifer ranging in depth from about 75 feet to greater than 125 feet (Refs. 4, pp. 3-4; 27, pp. 23-24). The area has been mapped as having a high pollution potential index by ODNR (Ref. 27, p. 24). The bedrock deposits comprising the buried valley walls are relatively impermeable compared to the sand and gravel aquifers. Water wells in the bedrock deposits generally yield less than ten gpm (Ref. 12A, p. 19; 29).

Aquifer Interconnection: Hydraulic communication between these two aquifers is generally either directly through gaps in the confining unit (i.e. the confining unit is absent in some parts of the buried valley) or by means of leakage through the confining unit (Ref. 12A, p. 18; 29). In order to better understand surface and ground water interactions at the well fields, the riverbed hydraulic characteristics of the Great Miami River were investigated. This investigation revealed ground water flow to the river north of the West Well Field, and surface water flow from the river to the ground water system adjacent to and south of both well fields. This suggests that recharge of the aquifers from the river is induced by ground water drawdown caused by pumping (Refs. 12A, p. 19; 29). The geologic cross-section of the area is shown in Panterra Report (Refs. 12A, pp. 20, 21; 29). In the vicinity of Troy, the confining unit between the upper and lower layer is not a continuous, laterally extensive unit, but rather consists of numerous irregularly shaped masses and lenses of fine-grained material of varying elevations interspaced with coarser deposits (Refs. 7, pp. 106-145; 8, pp. 116-129; 13, pp. 709, 743; 15, pp. 36, 38, 40-93; 29), and is absent over much of the east well field within one mile of the sources (Ref. 13, p. 709). Further, pump tests conducted at well 15 in Troy's east well field in 1994 and at Troy's east and west well fields

in 2000 demonstrated there is hydraulic communication between shallow and deep sand and gravel deposits, where the till unit is present. Moreover the well field capture zone appeared to extend beneath the river, suggesting that recharge of the deeper sand and gravel deposits are induced by ground water drawdown caused by pumping (Ref. 13, p. 10).

Therefore, the hydraulic interconnection between the upper and lower aquifer is well established and the lower and upper aquifer system will be referred to as the unconsolidated aquifer.

#### **SUMMARY OF AQUIFER BEING EVALUATED**

<b>Aquifer Number</b>	<b>Aquifer Name</b>	<b>Is Aquifer Continuous Within-4-Mile Target Distance Limit</b>	<b>Is Aquifer Karst?</b>
1	Unconsolidated Aquifer	Yes	No

### **3.1 LIKELIHOOD OF RELEASE**

#### **3.1.1 OBSERVED RELEASE**

Aquifer Being Evaluated: Unconsolidated Aquifer (combined upper and lower aquifer).

Direct Observation: - Spinnaker Property (Source 1)

An observed release, by direct observation, to the ground water migration pathway in the unconsolidated aquifer has been established at the Spinnaker property. This is based on detection of chlorinated solvents, primarily TCE, in soil samples collected below the ground water table on the Spinnaker property. The TCE was detected in soil samples collected below water table from the Spinnaker property (Ref. 7, pp. 121, 126 -127, 129-131, 372, 393, 456, 467, 470-472, 477). Soil samples were analyzed using SW-846-8260B (Refs. 7, pp. 18-21; 8, p. 9; 14, p. 5). As documented above in Section 2.2.2 for Source 1 – contaminated soil on the Spinnaker property, TCE is an attributable contaminant to the Spinnaker property.

## TCE SOIL CONTAMINATION BELOW WATER TABLE – SPINNAKER PROPERTY

Boring Code	Depth to water (ft bgs)	Sample Interval (ft bgs)	Hazardous Substance	Concentration Detected (µg/kg)	Year Drilled	References
SSB-4	13.0	12.5-14	TCE	634	5/2/2005	Ref. 7, pp. 121, 372, 393
SSB-9	12.0	12-14	TCE	77.2	5/3/2005	Ref. 7, pp. 126, 372, 466
SSB-10	12.5	12.5-14	TCE	175	5/3/2005	Ref. 7, pp. 127, 372, 456
SSB-12	13.0	13-15	TCE	68.6	5/4/2005	Ref. 7, pp. 129, 372, 467
SSB-13	10.0	11.5-12	TCE	233	5/4/2005	Ref. 7, pp. 130, 372, 470
SSB-13	10.0	12-13	TCE	5,890	5/4/2005	Ref. 7, pp. 130, 372, 471
SSB-13	10.0	13-15	TCE	111	5/4/2005	Ref. 7, pp. 130, 372, 472
SSB-14	13.0	13-15	TCE	1,200	5/4/2005	Ref. 7, pp. 131, 372, 477

Notes:

bgs – below ground surface

ft – feet

µg/kg – micrograms per kilogram

### Chemical Analysis: - Spinnaker Property (Source 1)

An observed release, by chemical analysis, to the ground water migration pathway in the unconsolidated aquifer has been established at the Spinnaker property. This is based on the analysis of ground water samples collected and analyzed from the monitoring wells and municipal drinking wells. The hazardous substance detected in the release to ground water pathway is TCE (See Table on Contamination Concentrations – Spinnaker Property in this HRS documentation record). The ground water sample analysis was completed using methods SW-846-5030B and SW-846-8260B (Refs. 8, p. 9; 14, p. 5). If the background concentration equaled or exceeded the detection limit, a significant increase is established when the sample measurement was three times or more above the background concentrations (Ref. 1, Table 2-3, p. 51589).

### Background Levels – Spinnaker Property

As discussed above, the background wells are screened in the same unconsolidated aquifer as the contaminated wells. The upper and lower aquifer in the unconsolidated material are connected (Refs. 12, pp. 1, 5, 7; 12A, pp. 18-21; 13, pp. 709, 743; 29). Based on the ground water flow direction of southwest to northwest monitoring wells EEIB4 and GZA1 are considered upgradient wells (Refs. 7, pp. 30, 34; 9, p. 13; 12A, pp. 50, 54, 64; 29; 33; 34).

## BACKGROUND WELL INFORMATION – SPINNAKER PROPERTY – SOURCE 1

Well Code	Screened Aquifer	Screened Interval (ft bgs)	Well Depth (ft bgs)	Well Depth (ft amsl)	Year Drilled	References
EEIB4	UC	10.1-20.1	21	807.62	1994	Ref. 15, pp. 6, 53
GZAB1 <sup>1</sup>	UC	8-18.5	20	808.33	1993	Refs. 7, p. 76; 15, pp. 36, 37; 16, p. 6; 29

**Notes:**

<sup>1</sup> -- Comparing Figure 1 on Page 76 of Supplemental Soil and Ground water Delineation Report and Figure 2 on Page 34 of Kimberly-Clark Well Construction Diagrams, monitoring wells GZAB1 and GZA1 represents the same well.

bgs – below ground surface

ft – feet

amsl – above mean sea level

UC -- Unconsolidated Aquifer

## BACKGROUND CONCENTRATIONS – SPINNAKER PROPERTY – SOURCE 1

Well Code	Laboratory Sample No.	Sample Date	Hazardous Substance	Concentration Detected (µg/L)	MDL (µg/L)	RL (µg/L)	References
EEIB4	L0703719-18	3/28/2007	TCE	0.46 J	0.25	1.0	Ref. 14, pp. 2-6, 36, 133
GZA1	L0703719-17	3/28/2007	TCE	0.481 J	0.25	1.0	Ref. 14, pp. 2-6, 34, 133

**Notes:**

RL – Reporting Limit

MDL- Method Detection Limit

µg/L – micrograms per liter

TCE – trichloroethene

J -Estimated

- Contaminated Well Concentrations – Spinnaker Property

## CONTAMINATED WELL INFORMATION – SPINNAKER PROPERTY – SOURCE 1

Well Code	Screened Aquifer	Screened Interval (ft bgs)	Well Depth (ft bgs)	Well Depth (ft amsl)	Year Drilled	References
EEIB-2	UC	9.6-19.6	21	804.1	1994	Ref. 15, pp. 5, 51
KMW-15	UC	26-30	30	797.59	2005	Ref. 7, pp. 70, 115, 116, 143
EEIB-12	UC	9-19	23	903.71	1994	Ref. 15, pp. 12, 61
KMW-8	UC	10-30	30	795.32	1995	Refs. 7, p. 64; 17, p. 487
PW-4	UC	13-28	28	793.56	1995	Refs. 7, p. 84; 17, p. 491
KMW-9	UC	9.5-29.5	29.5	795.91	1995	Refs. 7, p. 66; 17, p. 486

**Notes:**

UC – Unconsolidated Aquifer (upper and lower aquifer are hydraulically connected)

bgs – below ground surface

ft – feet

amsl – above mean sea level

As discussed in Section 3 and 3.0.1, the above wells are located in the unconsolidated aquifer (note: upper aquifer and lower aquifer in unconsolidated material are hydraulically interconnected). The combined aquifer is referred to as the unconsolidated aquifer.

#### CONTAMINATION CONCENTRATIONS – SPINNAKER PROPERTY – SOURCE 1

Well Code	Laboratory Sample No.	Sample Date	Hazardous Substance	Concentration Detected (µg/L)	MDL (µg/L)	RL (µg/L)	References
EEIB-2	L0703719-26	3/29/2007	TCE	1.50	0.25	1.0	Ref. 14, pp. 2-6, 49, 134
KMW-15	L0703719-23	3/29/2007	TCE	4.83	0.25	1.0	Ref. 14, pp. 2-6, 44, 134
EEIB-12	L0703719-14	3/28/2007	TCE	3.65	0.25	1.0	Ref. 14, pp. 2-6, 29, 133
KMW-8	L0703719-07	3/28/2007	TCE	4.68	0.25	1.0	Ref. 14, pp. 2-6, 18, 133
PW-4	L0703719-12	3/29/2007	TCE	1.46	0.25	1.0	Ref. 14, pp. 2-6, 54, 134
KMW-9	L0703719-09	3/28/2007	TCE	5.92	0.25	1.0	Ref. 14, pp. 2-6, 21, 133

Notes:

RL– Reporting Limit

MDL – Method Detection Limit

µg/L – micrograms per liter

TCE – trichloroethene

The ground water contamination on the Spinnaker property is shown in Ref. 33. Estimated ground water plume on the Spinnaker property is shown in Ref. 34.

**East Troy Contaminated Aquifer Plume Releases (Contaminated Plume – Source 2):** The East Troy Contaminated Aquifer Plume has received releases from several unidentified sources. The only source that has been identified is the Spinnaker property, which has been discussed above. Releases associated with the East Troy Contaminated Aquifer Plume area were detected by chemical analysis from numerous monitoring wells and municipal wells. Analysis of ground water within the plume area has documented observed releases of primarily PCE, TCE, cis-1,2-DCE and vinyl chloride into the ground water (See Table on Contaminated Well Information – East Troy Contaminated Aquifer in this HRS documentation record). If the background concentration equals or exceeds the detection limit, a significant increase is established when the sample measurement is three times or more above the background concentrations (Ref. 1, Table 2-3, p. 51589). VOCs were not detected in background wells, so all VOC detections greater than the detection limit qualify as a significant increase.

- Background Levels – East Troy Contaminated Aquifer (Source 2)

As discussed above, the background wells are screened in the same unconsolidated aquifer as the contaminated wells. The upper and lower aquifer in the unconsolidated material are connected (Refs. 12, pp. 1, 5, 7-9; Ref. 12A, pp. 18-21; 13, pp. 709, 743; 29).

**BACKGROUND WELL INFORMATION – EAST TROY CONTAMINATED AQUIFER  
(SOURCE 2)**

Well Code	Screened Aquifer	Screened Interval (ft bgs)	Depth (ft bgs)	Depth (ft amsl)	Year Drilled (a)	References
GP-10	UC	5-15	16	NA	2002	Refs. 9, p. 35; 25, p. 2
GP-11	UC	9-19	20	NA	2002	Refs. 9, p. 35; 25, p. 3

Notes:

UC – Unconsolidated Aquifer (upper and lower aquifer are hydraulically connected).

NA – Not Available

bgs – below ground surface

ft – feet

amsl – above mean sea level

(a) The year is based on Geoprobe investigations that were done in 2002

**BACKGROUND CONCENTRATIONS – EAST TROY CONTAMINATED AQUIFER  
(SOURCE 2)**

Well Code	Laboratory Sample No.	Sample Date	Hazardous Substance	Concentration Detected (µg/L)	RL (µg/L)	References
GP-10	GP10GW01	6/12/2002	TCE	ND	1.0	Refs. 9, pp. 35, 72, 84, 92; 9B, p. 6; 25, pp. 4, 5
			cis-1,2-DCE	ND	0.5	
			PCE	ND	1.0	
			VC	ND	1.0	
GP-11	GP11GW01	6/12/2002	TCE	ND	1.0	Refs. 9, pp. 35, 73, 84, 93, 94
			cis-1,2-DCE	ND	0.5	
			PCE	ND	1.0	
			VC	ND	1.0	

Notes:

RL – Reporting Limit

bgs – below ground surface

ft – feet

µg/L – micrograms per liter

cis-1,2-DCE – cis-1,2-dichloroethene

PCE – tetrachloroethene

TCE – trichloroethene

VC – vinyl chloride

ND – non-detect

- Contaminated Concentrations – Spinnaker property (Source 2)

### CONTAMINATED WELL INFORMATION – EAST TROY CONTAMINATED AQUIFER (SOURCE 2)

Well Code	Screened Aquifer	Screened Interval (ft bgs)	Well Depth (ft bgs)	Well Depth (ft amsl)	Year Drilled	References
GP01	UC	9-19	20	NA	2002	Ref. 9, pp. 34, 38
GP02	UC	9-19	20	NA	2002	Ref. 9, pp. 34, 39
GP03	UC	9-19	20	NA	2002	Ref. 9, pp. 34, 40
GP06	UC	9-19	20	NA	2002	Ref. 9, pp. 34, 43
GP07	UC	9-19	20	NA	2002	Ref. 9, pp. 34, 44
GP13	UC	9-19	20	NA	2002	Ref. 9, pp. 35, 47
GP16	UC	13-23	24	NA	2002	Ref. 9, pp. 35, 49
GP17	UC	9-19	20	NA	2002	Ref. 9, pp. 36, 51
KMW-16	UC	11-21	21	804.1	2005	Ref. 7, pp. 70, 131, 144
OEPA3	UC	12-22	22	803.13	2002	Refs. 7, p. 90; 9, p. 58
KMW-08	UC	10-30	30	795.32	1995	Refs. 7, p. 64; 17, pp. 470, 487
KMW-09	UC	9.5-29.5	29.5	895.91	1995	Refs. 7, p. 66; 17, pp. 471, 486
EEIB12	UC	9-19	23	803.71	1994	Refs. 7, 74; 15, pp. 12, 61
KMW-07	UC	10-20	20	806.25	1995	Ref. 7, p. 62; 17, pp. 469, 488
GZA1	UC	8-18	18	810.33	1993	Refs. 7, p. 76; 17, p. 495
EEIB4	UC	10.1-20.1	21	807.62	1994	Refs. 7, p. 72; 15, p. 6
KMW5	UC	10-20	20	805.94	1995	Refs. 7, p. 58; 17, pp. 467, 490
KMW11	UC	10.5-21.5	21.5	806.32	2005	Ref. 7, pp. 68, 139
KMW10	UC	10.5-20.5	20.5	806.47	2005	Ref. 7, pp. 68, 138
KMW15	UC	26-30	30	797.59	2005	Ref. 7, pp. 70, 115, 116, 143
KMW14	UC	10-12	20	807.11	2005	Ref. 7, pp. 70, 109, 142
EEIB2	UC	9.6-19.6	21	846.1	1994	Ref. 15, pp. 5, 51
PW3	UC	15-30	30	791.65	1995	Refs. 7, p. 82; 17, pp. 474, 492
PW4	UC	13-28	28	793.56	1995	Refs. 7, p. 84; 17, pp. 475, 491

Notes:

NA – Not Available

UC – Unconsolidated Aquifer (upper and lower aquifer are hydraulically connected).

bgs – below ground surface

ft – feet

amsl – above mean sea level

- Contaminated Samples – East Troy Contaminated Aquifer (Source 2)

Well Code	Laboratory Sample No.	Sample Date	Hazardous Substance	Concentration Detected (µg/L)	MDL (µg/L)	RL (µg/L)	References
GP01	GP01GW01	6/11/2002	PCE	18	NA	1	Ref. 9, pp. 34, 38, 63, 83, 125
GP02	GP02GW01	6/11/2002	PCE	2	NA	1	Ref. 9, pp. 34, 39, 64, 83, 127
GP03	GP03GW01	6/11/2002	TCE	34	NA	1	Ref. 9, pp. 34, 40, 65, 83, 133
GP06	GP06GW01	6/11/2002	cis-1,2-DCE	3.6	NA	0.5	Ref. 9, pp. 34, 43, 68, 84, 86
GP07	GP07GW01	6/12/2002	PCE	78	NA	2.5	Ref. 9, pp. 34, 44, 69, 84, 91
			TCE	5.8	NA	2.5	

Well Code	Laboratory Sample No.	Sample Date	Hazardous Substance	Concentration Detected (µg/L)	MDL (µg/L)	RL (µg/L)	References
GP13	GP13GW01	6/12/2002	VC	6.6	NA	1.0	Ref. 9, pp. 35, 47, 75, 85, 102
GP16	GP16GW01	6/13/2002	PCE	53	NA	2.0	Ref. 9, pp. 35, 49, 78, 85, 112
GP17	GP17GW01	6/13/2002	TCE	2.5	NA	2.0	Ref. 9, pp. 36, 51, 79, 85, 113, 114
			cis-1,2-DCE	62	NA	1.0	
KMW-16	L0703719-02	3/28/2007	TCE	3.72	0.25	1.0	Ref. 14, pp. 2-6, 9, 133
			cis-1,2-DCE	1.64	0.25	1.0	
OEPA3	L0703719-06	3/28/2007	cis-1,2-DCE	1.20	0.25	1.0	Ref. 14, pp. 2-6, 16, 133
KMW-08	L0703719-07	3/28/2007	TCE	4.68	0.25	1.0	Ref. 14, pp. 2-6, 17, 18, 133
			cis-1,2-DCE	16	0.25	1.0	
			VC	1.36	0.25	1.0	
KMW-09	L0703719-09	3/28/2007	TCE	5.92	0.25	1.0	Ref. 14, pp. 2-6, 21, 133
EEIB12	L0703719-14	3/28/2007	TCE	3.65	0.25	1.0	Ref. 14, pp. 2-6, 29, 133
			cis-1,2-DCE	1.8	0.25	1.0	
KMW-07	L0703719-15	3/28/2007	PCE	7.78	0.25	1.0	Ref. 14, pp. 2-6, 31, 133
GZA1	L0703719-17	3/28/2007	PCE	14.4	0.25	1.0	Ref. 14, pp. 2-6, 34, 133
EEIB4	L0703719-18	3/28/2007	PCE	14.6	0.25	1.0	Ref. 14, pp. 2-6, 36, 133
			cis-1,2-DCE	1.05	0.25	1.0	
KMW5	L0703719-19	3/28/2007	PCE	2.95		1.0	Ref. 14, pp. 2-6, 38, 133
KMW11	L0703719-21	3/29/2007	cis-1,2-DCE	45.9	0.25	1.0	Ref. 14, pp. 2-6, 41, 134
KMW10	L0703719-22	3/29/2007	cis-1,2-DCE	69.1	0.25	1.0	Ref. 14, pp. 2-6, 42, 134
KMW15	L0703719-23	3/29/2007	TCE	4.83	0.25	1.0	Ref. 14, pp. 2-6, 44, 134
KMW14	L0703719-24	3/29/2007	PCE	1.17	0.25	1.0	Ref. 14, pp. 2-6, 46, 134
			cis-1,2-DCE	3.77	0.25	1.0	
EEIB2	L0703719-26	3/29/2007	TCE	1.5	0.25	1.0	Ref. 14, pp. 2-6, 49, 134
			cis-1,2-DCE	2.38	0.25	1.0	
PW3	L0703719-28	3/29/2007	TCE	1.05	0.25	1.0	Ref. 14, pp. 2-6, 52, 53, 134
			cis-1,2-DCE	11.7	0.25	1.0	
			VC	1.96	0.25	1.0	
PW4	L0703719-29	3/29/2007	TCE	1.46	0.25	1.0	Ref. 14, pp. 2-6, 54, 134
PW4	L0703719-29	3/29/2007	cis-1,2-DCE	2.50	0.25	1.0	

Notes:

UC – Unconsolidated Aquifer

µg/L – microgram per liter

cis-1,2-DCE – cis-1,2-dichloroethene

PCE – tetrachloroethene

TCE – trichloroethene

VC – vinyl chloride

ND – non-detect

RL– Reporting Limit

MDL – Method Detection Limit



### Attribution:

The East Troy Contaminated Aquifer Plume site consists of a contaminated soil source (Source 1) at the Spinnaker property and associated TCE releases, and a mostly PCE-contaminated ground water plume (Source 2) that extends upgradient of the Spinnaker facility (see Sections 2.2.2 and 3.1.1 and Figures 2 and 3 of this HRS documentation record).

TCE is associated with Source 1, contaminated soil on the Spinnaker property, as it has been detected at significant concentrations in numerous soil samples collected from borings on the property (see Section 2.2.2, Source 1, of this HRS documentation record). TCE may have been released to facility soils due to leaks and/or spills. A hazardous waste storage area was used for temporary storage of drums of spent solvents and other hazardous materials until they were removed from the property (Ref. 7, pp. 12, 98). Empty drums were stored in a nonhazardous waste storage area (Ref. 7, p. 12). Soil sampling has identified significant levels of VOCs, primarily TCE, on the Spinnaker property (see Section 2.2.2, Source 1, of this HRS documentation record). An observed release of TCE to ground water by direct observation has been documented at the Spinnaker property because TCE was detected in soil boring samples collected from below the ground water table (Ref. 7, pp. 121, 126 -127, 129-131, 372, 393, 456, 467, 470-472, 477; Section 3.1.1, Observed Release—Direct Observation, of this HRS documentation record). An observed release of TCE to ground water by chemical analysis has been established because TCE concentrations detected in the ground water samples under the Spinnaker property are greater than three times background concentrations (see Section 3.1.1, Observed Release—Chemical Analysis, of this HRS documentation record).

PCE ground water contamination also underlies the Spinnaker property (Refs. 33; 34). The PCE ground water contamination at the Spinnaker property is at least partially attributable to the contaminated soil source (Source 1). In addition to the TCE, PCE was detected in soil boring samples collected from the facility at depths extending below the ground water table at sample locations SSB-4, SSB-9, SSB-10, SSB-13, and SSB-14 (Ref. 7, pp. 121, 126, 127, 130, 131, 372, 394, 456, 466, 471, 477; Section 2.2.2, Source 1, of this HRS documentation record). However, the PCE ground water contamination extends well upgradient of the Spinnaker property, and many of the highest PCE concentrations in ground water are in this upgradient portion of the PCE plume (see Section 2.2.2, Source 2, Section 3.1.1, Observed Release—East Troy Contaminated Aquifer Plume Releases, and Figures 2 and 3 of this HRS documentation record). This indicates that there are other sources of the PCE ground water contamination and that the PCE releases have commingled in the area. The unidentified sources of the PCE contamination appear to be located upgradient (southwest) of the Spinnaker property (Ref. 18;

Figures 2 and 3 of this HRS documentation record). Within the plume, cis-1,2- DCE and vinyl chloride are also present (Refs. 33; 34; Sections 2.2.2 and 3.1.1 and Figure 3 of this HRS documentation record). Cis-1,2-DCE and vinyl chloride are biodegradation products of PCE (Ref. 36, p. 2). Cis-1,2-DCE has also been detected in Source 1 (see Section 2.2.2—Source 1 of this HRS documentation record). PCE and TCE do not exist naturally in the environment and are manufactured chemicals (Refs. 37, p. 1; 38, p. 1). Significant ground water sampling has been performed to identify the sources upgradient of the Spinnaker property responsible for the PCE contamination, but the sources have not yet been identified.

Another possible source of the PCE contamination could be the Hobart Cabinet facility on East Water Street which runs parallel to Water Street toward Spinnaker Coating (Refs. 6, p. 5; 13, p. 5). Hobart Cabinet Company has been manufacturing steel storage products since 1907 (Refs. 6, p. 4; 21, p. 1). As part of Hobart operations, paint booths located in the back of the building were used to spray paint the steel cabinets. One PCE release appears to originate near Hobart Cabinet (Refs. 6, p. 5; 13, p. 5). Shallow soils were collected from the corner of the Hobart facility (SB-8) which contained low concentrations of TCE at 500 parts per billion (ppb) and PCE at 470 ppb (Ref. 6, pp. 11, 14).

**Source 1:** An observed release by direct observation and chemical analysis has been established for the Spinnaker property. Analysis of ground water from monitoring wells and municipal drinking water wells document an observed release of TCE. Soil samples taken below the water table establish an observed release of TCE by direct observation (See Section 2.2.2, Source 1, and Section 3.1.1 of this HRS documentation record).

**Source 2:** Source 2 is the release of PCE and its biodegradation compounds cis-1,2-DCE and vinyl chloride to the East Troy Contaminated Aquifer (See Section 2.2.2, Source 2, and Section 3.1.1 of this HRS documentation record) that extends to and has commingled with releases associated with the Source 1. The source(s) of PCE contamination in the East Troy Contaminated Aquifer has not been identified.

#### Hazardous Substances Released

TCE has been detected in ground water and soil samples on the Spinnaker property at concentrations greater than three times than the upgradient wells. TCE in one downgradient ground water sample exceeded the MCL of 5 µg/L (Ref. 14, pp. 18, 21, 29, 44, 49, 54).

PCE has been detected at several locations in the ground water samples in the East Troy area exceeding its HRS benchmarks of 5 µg/L as well as MCL of 5 µg/L at several locations (Refs. 9, pp. 34, 35, 91, 112,

125; 14, pp. 31, 34, 36). Other VOCs detected in the ground water samples exceeding HRS benchmarks in the East Troy area include cis-1,2-DCE; TCE; and vinyl chloride (Refs. 9, pp. 34, 86, 91, 102, 127, 133; 14, pp. 16, 18, 21, 49, 53). However, the sources contributing to the ground water contamination upgradient of the Spinnaker property have not been identified.

The target drinking water sources for both sources are the Troy Well Fields. An observed release to ground water has been documented by chemical analysis for Sources 1 and 2 resulting in a ground water observed release factor value of 550 (See Section 3.1.1 of this HRS documentation record).

Hazardous substances released from one or both sources include primarily PCE; TCE; cis-1,2-DCE; and vinyl chloride.

Ground Water Observed Release Factor Value: 550

### **3.1.2 POTENTIAL TO RELEASE**

As specified in the HRS Rule, since an observed release was established for the unconsolidated aquifer, the potential to release was not scored (Ref. 1, Section 3.1.2, p. 51595)

## 3.2 WASTE CHARACTERISTICS

### 3.2.1 TOXICITY/MOBILITY

All hazardous substances listed in the table below have been documented in soil and/or ground water samples from Sources 1 and 2 (See Sections 2.2.2 and 3.1.1 of this HRS documentation record). These hazardous substances were detected at concentrations significantly exceeding background levels.

Hazardous Substance	Source No. (and/or Observed Release)	Toxicity Factor Value	Mobility Factor Value	Does Hazardous Substance Meet Observed Release Criteria?	Toxicity/Mobility	Reference
PCE	1, 2, Observed Release	100	1	Yes	100	Refs. 1, Sections 3.2.1, 2.4.1.2, pp. 51601, 51590; 2, p. 22
TCE	1, 2, Observed Release	10,000	1	Yes	10,000	Refs. 1, Sections 3.2.1, 2.4.1.2, pp. 51601, 51590; 2, p. 60
Cis-1,2-DCE	1, 2, Observed Release	100	1	Yes	100	Refs. 1, Sections 3.2.1, 2.4.1.2, pp. 51601, 51590; 2, p. 17
VC	2, Observed Release	10,000	1	Yes	10,000	Refs. 1, Sections 3.2.1, 2.4.1.2, pp. 51601, 51590; 2, p. 24

Notes:

PCE – tetrachloroethene

TCE – trichloroethene

cis-1,2-DCE – cis-1,2-dichloroethene

VC – vinyl chloride

Because an observed release to the ground water migration pathway has been established, a mobility factor of 1 has been applied to the hazardous substances released (Ref. 1, Section 3.2.1.2, p. 51601). Mobility factor values for contaminants in source samples, but not detected in release samples, are from EPA SCDM (Ref. 2, pp. 17, 22, 24, 60). As shown in the table above, the toxicity/mobility hazardous constituent factor for TCE and for vinyl chloride is 10,000. The toxicity/mobility factor value of 10,000 was assigned based on Table 3-9 of the HRS Rule (Ref. 1, Section 3.2.1.3, p. 51602).

Toxicity/Mobility Factor Value: 10,000

### 3.2.2. HAZARDOUS WASTE QUANTITY

Source Number	Source Name	Source Type	Source Hazardous Waste Quantity
1	Contaminated Soil	Contaminated Soil	0.3
2	Contaminated Plume	Other	Unknown > 0
Sum of Source Hazardous Waste Quantity			>0.3

This information is from Section 2.4.2.2 above.

According to the HRS Rule, if the hazardous constituent quantity (Tier A) is not adequately determined for one or more sources with a containment factor value greater than 0 for the pathway being evaluated, and no target subject to Level I or Level II concentrations has been documented for the pathway, assign either the value from HRS Table 2-6 or 10, whichever is greater (Ref. 1, Section 2.4.2.2, pp. 51591, 51592). Because the hazardous constituent quantity cannot be adequately determined for either source (see Sections 2.2.1 and 2.4.2.1.1 of this HRS documentation record for both Source 1 and Source 2), and because actual contamination of a target well has not been established for scoring purposes, the hazardous waste quantity factor value is 10.

Hazardous Waste Quantity Factor Value: 10  
(Ref. 1, Table 2-6, p. 51591)

### 3.2.3 HAZARDOUS CHARACTERISTICS FACTOR CATEGORY VALUE

Toxicity/Mobility Factor Value: 10,000

Hazardous Waste Quantity Factor Value: 10

Product =  $1 \times 10^5$

Waste Characteristics Factor Category Value: 18  
(Ref. 1, Table 2-7, p. 51592)

### **3.3 TARGETS**

The primary targets are the populations served by the municipal wells that could potentially be exposed to contaminated drinking water. There are 5 wells in the East Well Field and 5 wells in the West Well Field (Refs. 4, pp. 3, 4; 19, pp. 8, 9). The City of Troy municipal system supplies water to approximately 28,000 people (Refs. 4, p. 4; 19, p. 9).

#### **3.3.1 NEAREST WELL**

City of Troy Municipal Drinking Water Well PW-14 is the nearest well, located within 0.25 mile from the source (Refs. 8, p. 20; 9, p. 18; 13, pp. 18, 743; 18). The concentrations of cis-1,2-DCE are estimated and below the reporting limit (Refs. 8, pp. 10, 14, 111, 113; 14, pp. 12, 14).

Level of Contamination (I, II, or potential): Potential

The municipal well fields do not meet the criteria for release to Level I and Level II concentrations. Therefore, the municipal wells will be subjected to potential for release, and a Nearest Well Factor Value of 20 has been assigned (Ref. 1, Section 3.3.1, p. 51602).

Nearest Well Factor Value: 20  
(Ref. 1, Table 3-11, p. 51603)

#### **3.3.2 POPULATION**

##### **3.3.2.1 Level of Contamination**

The population served by water from a point of withdrawal may be evaluated based on the level of contamination for that point of withdrawal (Ref. 1, Section 3.3.2.1, p. 51603). The 4-mile target distance limit is shown in Reference 18.

##### **3.3.2.2 Level I Concentrations**

Based on the HRS Rule (Ref. 1, Section 3.3.2.2, p. 51603), no targets are subject to Level I contamination.

Level I Contamination Factor Value: 0

### **3.3.2.3 Level II Concentrations**

Two municipal drinking water wells (PW-14 and PW-18) had detections of cis-1,2-DCE at estimated concentrations. The concentrations of cis-1,2-DCE were below the reporting limits (Refs. 8, pp. 10, 14, 111, 113; 14, pp. 12, 14).

Based on the HRS Rule (Ref. 1, Section 3.3.2.3, p. 51603), no targets are subject to Level II contamination.

Level II Contamination Factor Value: 0

### **3.3.2.4 Potential Contamination**

Cis-1,2-DCE has been detected at estimated levels in two municipal wells (PW-14 and PW-18); however, the concentrations are below the reporting limits (Refs. 8, pp. 14, 111, 113; 14, pp. 12, 14). The City of Troy obtains drinking water from two municipal well fields, East Well Field and West Well Field (Refs. 4, pp. 3, 4; 19, pp. 8, 9). There are 5 wells in the East Well Field and 5 wells in the West Well Field (Refs. 4, pp. 3, 4; 19, pp. 8, 9). Based on the information received from the City of Troy, the City has a blended water system (Ref. 28, p. 1). The City of Troy municipal system supplies water to approximately 28,000 people (Refs. 4, p. 4; 19, p. 9). A single well does not supply more than 40 percent of the system's water; therefore, the population was apportioned equally to each well resulting in a population of 2,800 persons per well (28,000 people/10 wells) (Refs. 1, Section 3.3.2, p. 51603; 4, p. 4; 19, p. 9).

As specified in the HRS rule, (Ref. 1, Section 3.3.2.4, p. 51603), the number of people served by the drinking water from points of withdraw subject to potential contamination were summed. A distance-weighted population value was assigned to each distance category based on the number of people served by wells within the distance category. The distance-weighted population values were assigned as follows.

#### Between 0 to 0.25 mile:

There are three municipal drinking water wells within this target distance limit. The wells (PW-14, PW-18, and PW-4E) are located in the East Well Field (Refs. 4, p. 3; 13, pp. 743; 18). The population allocated to three municipal wells is 8,400 (Ref. 19, pp. 1, 2, 5, 8). The distance-weighted population value for 0 to 0.25 miles is 5,214 (Ref. 1, Table 3-12, p. 51604).

Between 0.25 and 0.5 mile:

There are five municipal drinking water wells within this target distance limit. Two wells (PW-17 and PW-13) are located in the East Well Field and three wells (PW-16, PW-19 and PW-3W) are located in the West Well Field (Refs. 4, p. 3; 13, p. 743; 18). The population allocated to these five municipal wells is 14,000 (Ref. 19, pp. 1, 3, 4, 5). The distance-weighted population value for 0.25 to 0.5 miles is 10,122 (Ref. 1, Table 3-12, p. 51604).

Between 0.5 and 1.0 mile:

There are two municipal drinking water wells within this target distance limit. Two wells (PW-4W and PW-12W) are located in the in the West Well Field (Refs. 4, p. 3; 13, p. 743; 18). The population allocated to two municipal wells is 5,600 (Ref. 19, pp. 1, 3, 4, 5). The distance-weighted population value for 0.5 to 1.0 mile is 1,669 (Ref. 1, Table 3-12, p. 51604).

Between 1.0 and 2.0 mile:

No population has been allocated for this target distance limit. The distance-weighted population value for 1.0 to 2.0 miles is 0 (Ref. 1, Table 3-12, p. 51604).

Between 2.0 and 3.0 mile:

No population has been allocated for this target distance limit. The distance-weighted population value for 2.0 to 3.0 miles is 0 (Ref. 1, Table 3-12, p. 51604).

Between 3.0 and 4.0 mile:

No population has been allocated for this target distance limit. The distance-weighted population value for 3.0 to 4.0 mile is 0 (Ref. 1, Table 3-12, p. 51604).

The distance-weighted population values are summed and multiplied by a factor value of 0.10.



## DISTANCE-WEIGHTED POPULATION VALUE

Distance Category	Municipal Wells	Population	References	Distance-Weighted Population Value (HRS Rule Table 3-12)
0-0.25	East Well Field = 3 West Well Field = 0	8,400	Ref. 19, pp. 1-9	5,214
0.25-0.5	East Well Field = 2 West Well Field = 3	14,000	Ref. 19, pp. 1-9	10,122
0.5-1.0	East Well Field = 0 West Well Field = 2	5,600	Ref. 19, pp. 1-9	1,669
1.0-2.0	None	0	--	0
2.0-3.0	None	0	--	0
3.0-4.0	None	0	--	0
Total	East Well Field = 5 West Well Field = 5	28,000	--	17,005

Notes:

HRS—Hazard Ranking System

Sum of Distance-Weighted Population Values: 17,005 individuals

Sum of Distance-Weighted Population Values x 0.10: 1,700.5

Potential Contamination Factor Value: 1,700.5

### 3.3.3 RESOURCES

Ground water within the four-mile radius is used as an ingredient in commercial food preparation (Refs. 4, p.4; 19, p. 9). Therefore, resources have been assigned a value of 5 (Ref. 1, Section 3.3.3, p. 51604).

Resources Factor Value: 5

### 3.3.4 WELLHEAD PROTECTION AREA

The federal Safe Drinking Water Act amendments of 1986 established the Wellhead Protection Program, which required states to administer a source water protection program for their systems using ground water (Refs. 31; 32, p. 1). In 1992 Ohio's Wellhead Protection Program was approved by the U.S. Environmental Protection Agency (USEPA) (Ref. 31). Both sources lie within the well head protection area (Ref. 12A, pp. 6, 25, 34; 8, p. 20; 29). Sources 1 and 2 have a containment factor greater than zero and Source 1 lies above the wellhead protection area (Ref. 12A, pp. 6, 25, 34; 8, p. 20; 29; Section 2.2.4. of this HRS documentation record). An observed release to the ground water at the site is documented (See Section 3.1.1 of this HRS documentation record). A value of 20 is assigned to the site for the wellhead protection area factor (Refs. 1, Section 3.3.4, p. 51604).

Wellhead Protection Area Factor Value: 20

### **3.3.5 CALCULATION OF TARGETS FACTOR CATEGORY VALUE**

The total targets factor category value is the sum of the nearest well, population, resources and wellhead protection area (Ref. 1, Section 3.3.5, p. 51604). The total target factor category value for the site is 20 (nearest well), 1,700.5 (population), 5 (resources), 20 (wellhead protection area) = 1,745.5.